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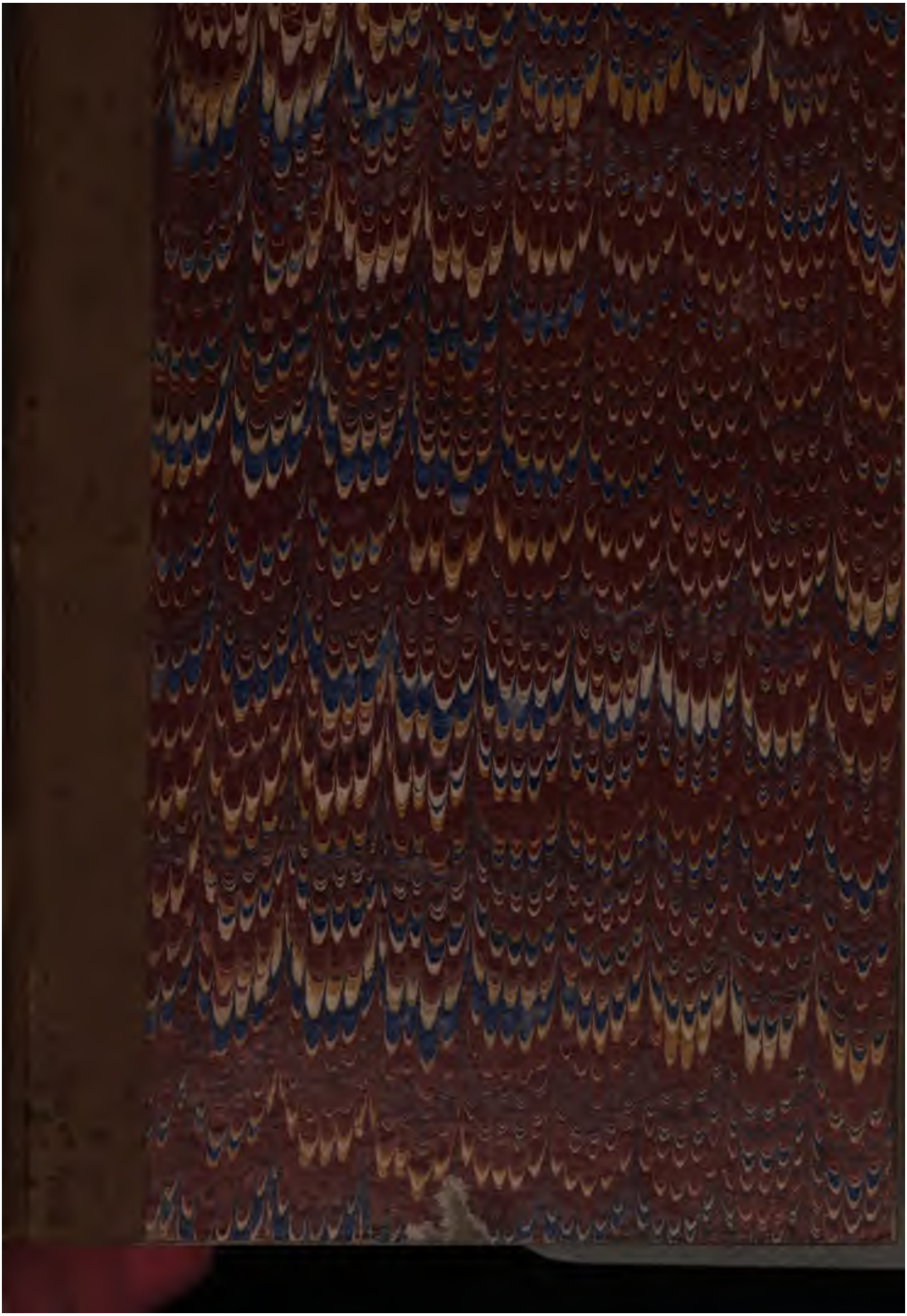

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PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO THE

STEAM ENGINE.

PART II.—A.D. 1860–1866.

(*in two volumes.*)

VOL. II.

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THE STEAM ENGINE.

1865.

A.D. 1865, January 2.—N° 4.

BEVAN, Edward, and FLEMING, Abel.—This invention relates to a jacket or protector for metallic vessels, the object being to prevent or retard loss of heat by radiation, and to insulate vessels or structures containing fluid or other substances, so as to maintain such substances at a uniform temperature, either above or below the temperature of the atmosphere. The vessels may be wholly or partially inclosed by the jackets or casings, within which, surrounding the vessels or the parts jacketted, there is a medium of gaseous fluid, preferably other than the atmosphere. To maintain the space between the casing and the inclosed vessel, small packing pieces of earthenware or other non-conducting substance may be used. When the temperature is high or fluctuating, one or more small openings may be left in the casing, and such openings may be provided with suitable safety valves.

Various applications of the invention, comprising a steam boiler, a steam engine cylinder, a metallic vessel for domestic purposes, and other articles, all of which are furnished with casings of suitable form, are described and illustrated.

[Printed, 8*d.* Drawings.]

A.D. 1865, January 4.—N° 19.

KEIRBY, Edward.—This invention relates to the manufacture of elastic packings for pistons, and to a lubricating compound. The packing, in the form of a flat web or rope, is composed of two or more hempen or other fibrous strands, united by binding weft in a loom or other suitable machine. A web, composed of four strands separately plaited in an ordinary braiding machine, is described; each plait contains by preference an elastic india-rubber core, and previous to being manufactured into web, it is saturated with the special compound or other lubricating composition. When formed, the packing web is passed between smoothing rollers, and then through the melted lubricant. When cool, the size of the packing may, by gentle hammering on a smooth hard surface, be reduced. In packing large pistons, and in pump buckets, two or more overlapping coils may be required, and for stuffing boxes, it is coiled into the chamber, and at each turn suitably pressed down. The lubricant consists of 1 part by weight of soda ash, 3 parts of oil or tallow, 1 part of lead ore, and 2 parts of soap. An iron pan or vessel containing a small quantity of water is placed over the fire. The soda ash and soap are first put in and dissolved, then the oil or tallow and the lead ore are added, the heat being increased and the compound occasionally stirred until all are thoroughly dissolved. The lubricant is used in a heated state.

[Printed, 8*d*. Drawing.]

A.D. 1865, January 5.—N° 33.

KIRBY, JOHN MALSBURY.—This invention relates to apparatus for generating steam and heat applicable either as motive power for driving engines or for heating purposes. It consists of a chamber constructed "of iron or other metal or fire-bricks, by " preference in the form of an inverted cone or dome, with a fur- " nace beneath. The floor of the chamber which forms the top " of the furnace should be horizontal or flat. Behind the furnace " a flue is constructed, and an opening is made for the ingress of " cold air which rushes into the chamber by a pipe fixed in an " oblique position, so that the air readily ascends therein. At " the top of the chamber is an exit pipe for the heated air and " steam, and brickwork is set up to enclose or complete the cham- " ber. Through the front of the chamber a water supply pipe is " passed, extending close to the middle of the chamber, down " which water is allowed to flow slowly so as to drop upon the " hot plate or floor, and thus become instantly converted into " steam. Coal or coke may be used in the furnace, but jets of " gas, or flame from oil will in most cases be found sufficient."

A modification of the invention, adapted to portable heating *stoves, consists* in applying damped or wetted absorbent material to the heated surfaces, the supply of moisture being kept up by capillary attraction. Gas or oil is used as the heating agent, and air tubes conduct into the chamber, the required amount of air to ensure combustion.

[Printed, *6d.* Drawing.]

A.D. 1865, January 5.—N° 35.

WILSON, James Edwards.—(*Provisional protection only.*)—This invention relates to locomotive engines, and to railway carriage springs. In constructing a locomotive engine, it is preferred to employ four pairs of wheels, which are coupled together by coupling rods and outside crank pins, actuated by crank arms on the end of a central crank shaft, which is driven by two steam engine cylinders respectively disposed between the side framing. In order that the engine may work freely round curves, the fore and after axle boxes are allowed a limited amount of play between their horns, and move endways a short distance, to permit which, the crank pins are made spherical, and the couplings of the rods shaped to correspond, as also the piston connecting rods, and engine cranks.

Railway carriage springs are made with flat straight bars of tempered steel, so arranged that a greater or lesser number of the bars come into action in proportion to the weight of the load, whereby both light and heavy loads ride upon the springs with the same amount of elasticity.

[Printed, *4d.* No Drawings.]

A.D. 1865, January 5.—N° 37.

AMOS, James Chapman, and ANDERSON, William.—This invention relates to the construction of tubular boilers, and to the means for cleaning the tubes. The boiler consists of two horizontal cylindrical shells, placed a few inches apart one over the other and united by two short tubular connecting necks, which support and form water communications between the upper and the lower section. The latter, which in front extends beyond the upper section, contains the furnace, bridge, ash chamber and flue; the upper section, below the water level, is filled with tubes through its whole length, the ends constituting the tube plates. The boiler is set in brickwork, which forms external flues. The flaming *gaseous* products of combustion pass from the furnace out at the back end of the lower section, coursing upwards and through the tubes in the upper section to the front, then take into the side flues, which are open to the space between the sections, passing downward into a flue beneath the lower section, and thence through an uptake in connection with the chimney. In some cases heating tubes are placed in the flue towards the back end of the lower section, and other modifications are described. The apparatus for cleaning the tubes consists in so placing a hollow disc in the back flue opposite the end of the upper section, that a series of nozzles, which correspond in number therewith, point respectively directly into the tubes. When the latter require cleaning, the disc is advanced to the tube plate, so that the end of each nozzle enters the mouth of its corresponding tube; steam is then let into the hollow disc, and emitted in forcible jets through the nozzles into the tubes, whereby all sooty and other deposit is dislodged, and blown out at the opposite end of the section.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1865, January 6.—N° 48.

DE BERGUE, Charles.—(*A communication from Auguste de Bergue.*)—(*Letters Patent void for want of final Specification.*)—This invention consists in adapting air chambers to locomotive engines, and fitting them with valves in connection with the reversing gear, so that, when the steam is shut off, the cylinders may, during the momentum of the train, so act as air pumps by forcing air into the chambers, that an increasing resistance is offered to the pistons, and consequently to the momenta of the engine and carriages. The air so compressed is also made to act on pistons in small cylinders connected with break blocks, fitted to assist retardation against the travelling wheels or rails. Also fitting valves for temporarily closing the blast pipe, and admitting air thereto otherwise than down the funnel, so as to prevent the admission to the cylinders of grit or dust. Safety valves are to be fitted to the chambers to limit the pressure.

[Printed, 4*d.* No Drawings.]

A.D. 1865, January 6.—N° 51. (* *)

ROBERTSON, James.—(*Provisional protection only.*)—" Im-" provements in furnaces, ash-pits and flues for the consumption

" of smoke and noxious products of combustion, and in the " apparatus or means connected therewith." An air-tight door fitted with a tube through which air is forced closes the ash-pit, or perforated tubes may be placed near the fire-bars, or into the furnace. From a number of furnaces the smoke is brought into one flue and passed over highly heated surfaces; and air may also be admitted. Or a box may be placed below the fire-bars, so constructed that the front part can be " lowered " in order that the ashes may be discharged. This box may be " either open on the top or be fitted with a perforated cover; " it has" openings in front " through which the air is forced, " thence up through the fuel and along the flues. When loco- " motive engines are travelling, the currents of air forced in through " the openings in the ash pan are sufficient to force the air through " the fire and flues. When it is desired to kindle fires for" " getting up steam in locomotive, steamboat and other boilers, " it is poposed to employ " blast apparatus, " from which a tube " is led into the ash-pit, fire-bars, fire-box, or into the tubes." " The upper part of a boiler" is covered " with a material of low " conducting powers leaving a space between the boiler and the " covering, thus forming" a " flue through which the air is allowed " to pass from an opening made at that part of the flues furthest " from the furnace door, at which latter point the air is forced in, " whence it travels along between the boiler and covering to the " front end of the furnace at this point. An elastic or other tube " is fixed and leads to an orifice in the top of the furnace door." The door is " made hollow and open at the bottom, where the air " is forced through an opening in the dead plate into the " closed ash-pit. " In some furnaces, the fire-bars, instead of being " made of metal, may be constructed of fire-clay, hollow and " perforated, and the air is then forced through them at the " opening in the front whence it passes up through the per- " forations into the fuel and along the flues." " No tall shaft is required."

[Printed, *4d.* No Drawings.]

A.D. 1865, January 7.—N° 55.

GALLOWAY, GEORGE BELL.—This is a multifarious invention, which amongst other things relates to motive power, and to means and appliances for communicating between travellers and others.

It is in part supplementary to two prior Letters Patent, granted to this inventor and respectively bearing date October 31, 1857, No. 2765, and March 15, 1859, No. 651.

Water and air are forced into steam boilers for the production of motive power. The upper flue tubes of locomotive and marine boilers, are not to be covered with water, in order that space may be obtained for the atmosphere, forced in to mingle with the steam generated from the water, which is confined to the lower part of the boiler, and only surrounds the furnace and lower ranges of tubes. In large boilers a coke fire is arranged, over which the products of combustion are caused to pass before entering the chimney flue. The pipes through which the water and air are forced into the boiler, are arranged to pass along the sides of the furnace. The motive power generated, may either be applied direct to steam engines, or received in an accumulator, wherein, previous to its use, the elastic force of the combined fluid may be increased by surcharging it with heat.

Electricity in combination with steam and air is to be employed to produce motive power.

The burning gases and heated products of combustion from boiler furnaces, are to be detained in the tubes and flues by making the latter more extended and tortuous, and the flames are to be split by angular divisions disposed in the flues. These divisions when arranged to be set in motion are to cause the removal of sooty and cinerary deposits. Jets of heated air are to be forced upon the fire and into the flues, and the steam feed pipes are to pass through a fire-box in order to improve the expansive quality of the steam. To prevent friction, a "semicircular eccentric motion" is to be substituted for the crank motion on the ends of shafts, and revolving anti-friction surfaces are to be presented to those and other parts of engines which have to sustain friction.

Describes locomotive carriages for the transit of goods on common roads, fitted with telescopes for distinguishing distant objects, and eye-glasses are to be fitted into the cap-peaks of guards and engine drivers for the same purpose. The engines may be of any ordinary construction, or of such form or principle of "planet "motion," as is described by this inventor in the Specification of a Patent dated November 9, 1864, No. 2779. Or the principle
spiral motion may be adopted, and amongst other things,
y flanged guiding wheels are to be employed for preventing
y engines and carriages from leaving the rails.

The invention further relates to driving screw propellers, and affixing the propellers, described in the last-named Patent, on separate shafts, so as to work beside or above each other in different directions at a high velocity, in order that screws of lesser diameter may be employed.

Steering or guiding the engine or carriage, is to be effected by a centre wheel under the management of the conductor or guard, and brakes of special construction, to act in conjunction with the buffers or otherwise, are to be employed. The chimney is to be divided by a longitudinal partition, and the products of combustion and exhaust vapour are to be carried off and distributed without noise by a number of pipes, or they are to escape into the atmosphere from a perforated chamber.

Hand-pumps are to supply air to an accumulator, through spirally formed pipes which pass through a coke fire; when the engine is set in motion, the pumps are to be connected thereto, and the reactive power of weights and springs, raised or compressed whilst descending inclines, is to be availed of whilst ascending.

Communication between persons travelling in separate carriages, is to be made by means of doors leading from one carriage to another, and speaking tubes with branches and mouth-pieces are to be fitted as the means of communicating with the guard. The several compartments and other places are to be lighted up by means of a composite wire, of which magnesian wire forms the chief element in combination with other metallic or carbonaceous substances.

[Printed, 6*d*. No Drawings.]

A.D. 1865, January 11.—N° 82.

SPENCER, John Frederick. — This invention relates to regulating and working the valves of steam and other engines. Two distinct sets of valves and "escapement gear" are employed, one for admitting the steam to the cylinder, and the other for the exhaust. These valves are opened by excentrics and closed by springs; the mode of operating them by means of two spring plates connected to a reciprocating weigh shaft actuated by an excentric, constitutes the 1st part of the invention. The 2nd consists in the introduction and application of two or more admission ports or passages in each end of the cylinders, the slide valves being operated by escapement gear. 3rd. Attaching the piston of a small cylinder to the spindle or lever of the admission valve when worked by escapement gear, so that the valve may be closed by steam pressure instead of by weights or springs. 4thly. Introducing into the escapement gear spring arrangement, whereby the admission valves are closed, a spiral steel or india-rubber spring at the back of the piston, to act as a cushion and reduce the shock. 5thly. “ Forming one central chamber fixed midway to the cylinder or engine framing and arranged to contain “ the two air pistons and dash pots, and the recoil springs, such “ chamber to be equally divided by a central diaphragm and to “ have moveable ends or covers for ready access to the dash-pot “ pistons and recoil springs of each admission valve.” Finally, it is stated, that to each cylinder there are two admission valves, two pairs of spring plates, two dash-pot pistons, and two springs or sets of springs for closing the admission valves when the escapement gear is disengaged. The exhaust valves may be worked by one excentric.

[Printed, 8*d*. Drawing.]

A.D. 1865, January 11.—N° 89.

RAMSBOTTOM, JOHN.—This invention relates to steam hammers, and to apparatus employed in combination therewith. It consists (1st) as follows:—The hammer blocks of duplex steam hammers, which act on the same horizontal plane, so as to approach each other from opposite sides and strike the interposed metallic mass or article simultaneously, are supported upon a series of rollers mounted in fixed bearings, formed in flanges attached respectively to the sides of the hammer heads. These steam hammers are constructed in the manner described by this inventor in the Specification of prior Letters Patent which were granted to him and bear date April 13, 1863, No. 924.

2nd. “ Consists in supporting the rails upon which the truck “ for the ingot travels, on a rocking frame or platform, or in “ traversing the said rails laterally for the purpose of keeping the “ article to be hammered midway between the hammer heads, so
sides of the article may be struck simutaneously.”
rting the ingot whilst being operated upon by duplex
rs, in centres fixed to headstocks, one or both of

which are made to yield divergently, and thus provide for the elongation of the ingot which lengthens out in proportion as its bulk is reduced by the hammers. Other devices are resorted to for effecting the same object.

3rd. Consists in imparting to the trucks which support the metallic mass or article, a to-and-fro motion during the hammering process, by means of the steam or other power. This may be accomplished by a piston or ram connected to the truck, by a friction apparatus, or by a rack and pinion or a screw in connection with reversing gear similar to that which is employed to reverse the motion in planing machines.

[Printed, 10*d.* Drawing.]

A.D. 1865, January 11.—N° 94.

COOPER, Abraham.—(*Provisional protection only.*)—The object of this invention, which relates to furnace flues, is to effect the consumption of smoke. It " consists in erecting underneath " the boiler, or in the flue of flued boilers, one or more ' bridge " walls,' by preference three, being placed at convenient distances apart, and constructed of " bricks or stones, or other suit" able material. On the top of the said ' bridge walls ' I place or " build a ' bridge ' of cast iron, fire bricks, or sandstones, or " other suitable material connected together by means of a bolt or " bar of iron passing through each and all of them, and secured " on the outside of the boiler walls by a nut and washer or other " suitable appliance. The above-named ' bridges ' I build at a " greater distance from the bottom of the boiler or top of the " flue according to their greater distance from the furnace mouth, " thereby improving the draught in the flue. The . . . . ' bridges ' " . . . . are built in a curved shape so as to suit the curvature of " the bottom of the boiler or flue, and are also curved towards " the furnace mouth so that the flame being heavier than the " smoke impinges against the curved portion of the ' bridge ' " and so curls over the top and meets the smoke, which passes " through the flame, and so becomes consumed. The ' bridge " ' walls ' may be connected by inverted arches of brickwork or " other suitable materials to assist in catching the sparks and to be " more readily cleaned out."

[Printed, 4*d.* No Drawings.]

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No 96.

[illegible] vention relates to a com- [illegible] engine, and to coal getting [illegible] ar. " For the purpose of con- [illegible] on rod of a reciprocating steam [illegible] works the piston of the air pump, [illegible] piston being the same. The two [illegible] and air pump cylinders are both [illegible] place, by which they are readily retained [illegible] two end covers of the two cylinders [illegible] are constructed, and through which the [illegible] close as may be together, simply allowing [illegible] two stuffing boxes." The air pump is con- [illegible] vessel, and is surrounded by cold water con- [illegible] plied. The use of a fly wheel and crank shaft are [illegible] the change of motion of the steam piston being [illegible] a tappet at each end of the cylinder. The outlets of [illegible] boxes of the air pump are connected by a pipe, with [illegible] the pipe supplying the compressed air to the air engine [illegible]. When these air engines or machines are necessarily distant from the air pump, two or more reservoirs for compressed air are disposed at intervals between the pump and the machines, for the purpose of equalizing and rendering the pressure of the supply more uniform.

Instead of working the lever picks of the coal getting machines in the usual way, their cutting points are made to commence cutting on the back of the material, and work outwards, a [illegible] or cut the required depth being first made by hand or otherwise.

(Printed, 10d. Drawings.)

A.D. 1858, January 13.—No [illegible].

[illegible] W[illegible]. — *A communication from Philibert [illegible].*

This invention, relating to steam engines, consists in causing [illegible] attached to one side of the piston of one cylinder. [illegible] the piston of a second cylinder. Steam is ad- [illegible] each revolution of the crank. The piston and [illegible] ms, which work reciprocally in two cylinders, [illegible] other, one being double the area of the other

A stuffing box is interposed between the cylinders, through which the piston rod works. The slide valve directing the course of the steam, is so arranged, that the steam acts first on one face of the smaller piston, whilst the other face and one face of the larger piston are temporarily open to the atmosphere. At the end of the stroke, the communication with the atmosphere is closed, and the steam is exhausted partly to the other end of the small piston, and partly to the corresponding side of the large piston, the other side of which is permanently open to the atmosphere. When the steam is worked expansively, a valve may be used with four orifices, and when condensing apparatus is employed, the steam is worked at mean pressure, and both ends of the larger cylinder are then brought into operation.

[Printed, 8*d*. Drawing.]

A.D. 1865, January 13.—N° 113. (* *)

LEWIS, Richard.—(*Provisional protection only.*)—" Improve-" ments " in steam boilers, consisting in replacing the flue tubes of multitubular boilers by " a simple undulating flue " " placed " either horizontally, laterally, or vertically." Tubes may be " fitted at the top of the bends of the flue ; " and apertures may be made in the boiler for cleaning out the flue spaces.

[Printed, 4*d*. No Drawings.]

A.D. 1865, January 14.—N° 119.

DAVIES, George.—(*A communication from Alexander Forbes Porter.*)—This invention relates to the use of an electrical apparatus for preventing incrustation or calcareous deposits in steam boilers. It is horizontally disposed about mid-height in the steam space of the boiler, attached to the lower end of a vertical rod, rigidly fixed through the upper part of the boiler shell. The lower end of this rod carries a fixed block, which is insulated by means of interposed glass or porcelain. This metal block has two projections, respectively pointing towards the ends of the boiler; a horizontal metal rod is screwed into one projection. The extreme free end of this rod carries a spherical metal ball, which is furnished with a number of radiating pointed wires. Into the opposite projection which points to the other end of the boiler, a pin with a spherical head is screwed, and a similar pin, head downward, is screwed up into the top of the shell near to the end of the boiler. The ends of a coil of wire are fixed respectively into the head of each pin, so as to form a direct communication between the insulated apparatus and the boiler shell. The electrical action on the boiler caused by the apparatus, prevents the accumulation of incrusted calcareous matter.

[Printed, 8*d.* Drawing.]

A.D. 1865, January 17.—N° 142.

BEST, Sealy James, and HOLDEN, James John.—This invention relates to apparatus actuated by steam power for charging and drawing the coke from gas retorts, the object being to effect by mechanism an operation which had previously been performed by hand labour. A high-pressure engine is employed; the cylinder is inverted and attached to the side of a vertical boiler, giving motion to a crank shaft below, which by the suitably arranged mechanism, effects the fetching of the coal and the charging of the retorts therewith, and also the withdrawal and removal of the coke; the invention being also applicable to feeding the furnaces of boilers, and of ovens, and drawing or discharging the burning fuel therefrom. One or a series of retorts are charged simultaneously, the charging scoops being severally supplied with the requisite quantity or weight of coal or fuel. The covers of the series of retorts are mounted in a frame, or suspended by chains from a bearing bar and balanced, so that the whole set may be conveniently raised at the same time to open the retorts, and after the charging operation, simultaneously closed. Suitable motions are given to the series of drawing rakes, and the feeding scoops are made to traverse to and fro on trams, in concert with the charging, drawing, and tipping operations of the apparatus.

[Printed, 4*s.* 6*d.* Drawings.]

A.D. 1865, January 18.—N° 155.

FOSTER, William Robert.—This invention, relating to packings applicable to the pistons and piston rods of steam and other engines, air and other pumps, stuffing boxes, hydraulic presses, and similar purposes, consists " in the application of a
il or rings of india-rubber tube around the rod in the stuffing
, and compressed therein somewhat in the usual manner of
ressing the packing of stuffing boxes. The tube in the

stuffing box of a steam engine piston rod, for instance, I leave " open at the inner end, but close it at the upper or outer end " next the gland, so that the steam may enter within this stuffing " box tube, which is therefore subject to the same pressure internally and externally, and will cause the passage for the rod " through it to be steam-tight. I use vulcanised india-rubber " tube of round, oval, or other form, in cross section, and apply " sufficient length of tube to coil round the rod several times. " This packing, when compressed slightly by the packing gland, " will compress the coils somewhat to the form of the box and " around the rod, whereby it is rendered tight, and this with " very slight pressure of the gland, therefore producing very " little friction on the rod in working through it." The tube may be protected with a covering of canvas or braided externally with hemp or other fibrous material.

When applied as a packing for pistons, and in similar cases where the fluid pressure is on both sides, the orifice of the tube is to be completely plugged or stopped about its mid length, and both ends are to be left open.

[Printed, 8*d.* Drawing.]

A.D. 1865, January 19.—N° 159.

PREGER, Adolf Wilhelm.—(*A communication from Ludwig August Riedinger.*)—This invention relates to coupling together two steam engines, or to coupling a steam engine to a water-wheel, turbine, or other prime mover. One engine (when two are coupled) gives constant motion to a spur wheel, which is fixed upon a hollow shaft. This shaft is mounted in suitable bearings, beyond which one end of the shaft projects, whereon is fixed one-half of a clutch box. The other or sliding half of the clutch, is mounted upon a solid shaft, which rests in bearings rectilineally disposed beyond the bearings of the hollow shaft, through which the solid shaft passes, and revolves without contact. Instead of clutches, friction plates or cones may be employed, the sliding half or section upon the solid shaft being made to engage with the fixed section upon the end of the hollow shaft in the usual way, by means of a hand lever. The motive powers thus coupled may be either worked conjointly, or independently of each other, and may be connected and disconnected whilst in motion.

[Printed, 10*d.* Drawing.]

A.D. 1865, January 19.—Nº 165.

SHIPTON, James Alfred, and MITCHELL, Robert.—This invention relates to shaping and forging metals for the manufacture of tees, elbows, bends, and couplings for gas fittings, and articles for other purposes. The apparatus may be operated by motive power or by hand. An arrangement adapted for the application of steam power, consists of two steam cylinders, which are mounted on a horizontal framing, and disposed so that the ends of the piston rods, into which are fitted a pair of dies, meet in a direct line at the end of their outward stroke. Under this point of meeting there is fixed upon the foundation plate a metallic block or mould, and directly over, carried by a suitable framing, fixed inverted in vertical position, another steam cylinder, the end of the piston rod of which is fitted with a mandrel or die, which at the end of its outward action converges to the point occupied by the block or mould, which is also reached by the pair of dies carried respectively by the piston rods of the horizontal cylinders. A piece of metal shaped to the required form is laid upon the block or mould, and a mandrel is forced therein by the descent of the piston in the cylinder above. This part of the process presses the metal into the mould, causing the edges to turn up. Steam is then admitted to the backs of the pistons in the horizontal cylinders, causing the dies fitted to the ends of their piston rods to advance simultaneously and press the metal upon the mandrel, and by repeated blows shape it to the required form.

A second machine is adapted for forging, planishing, and finishing such articles. The valves, operated by means of levers, are moved by hand. Suitable sets of dies and mandrels, and corresponding moulds are required to shape and finish the several articles manufactured by the process.

[Printed, 10*d*. Drawing.]

A.D. 1865, January 19.—Nº 166.

HICKS, William Cleveland.—This invention, relating to steam engines, consists in a novel arrangement of four single-acting cylinders, and in the construction of the pistons, which also act as valves for the distribution of the steam; and, although the ordinary valve gear and steam chests are dispensed with, all the principles of the operation of ordinary slide valve engines are retained. The four cylinders are rectangularly disposed on one plane to act upon a central crank. The pistons are cylindrical of the trunk order, recessed to receive the connecting rods which are jointed therein; the free ends of the rods abut against the crank pin. No couplings are used, the ends being kept in position by a ring as they oscillate with the sweep of the crank. An ordinary slide valve to start and stop the engine, is used to admit the steam into the several passages in communication with the cylinders, in the sides of which those to induct the steam are situated. The pistons are acted upon in succession in the direction of the crank, the steam being admitted to the cylinder about to commence its inward stroke, by the uncovering of its induction port at a certain part of the inward movement, by the preceding piston, when the steam passage in the piston about to be acted upon is coincident with the induction port. The exhaust from each cylinder is managed by a similar arrangement of the valve-acting pistons. The disposition of the cylinders may be modified, and other fluid used for the motive power. The engine may also be used as a pump.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1865, January 19.—N° 167.

DURHAM, Thomas Charles.—(*Provisional protection only.*)— This invention, relating to locomotive and other steam engines, consists in the employment, in one cylinder, of two pistons with separate piston rods. These rods reciprocate motion upon a duplex crank arm attached to the axis of a wheel. The cylinder, which is double the length of the stroke, is parallel throughout. The piston, which works in the front end of the cylinder, has a hollow piston rod, through which the solid rod of the other piston is fitted to slide. The hollow rod carries a cross head, to which two side connecting rods are jointed; these rods are coupled to the outer throws of the duplex crank arm; the solid piston rod acts upon the central throw by means of a single connecting rod. The motions of the pistons are simultaneous in opposite directions, the crank throw pins being diametrally in a line with the axis. The steam is admitted alternately between the pistons and to the cylinder ends, one piston performing its up stroke, whilst the other performs its down stroke, and vice versâ.

[*Printed 8d. Drawing.*]

A.D. 1865, January 20.—N° 173.

HEWES, John.—This invention, relating to puddling, heating, and reverberatory furnaces, is also applicable to the furnaces of steam boilers of the stationary class, in reference to which, its adaptation to the furnace of a horizontal cylindrical boiler with hemispherical ends, is shown and described.

The furnace is built of brick or other suitable material, with a range of fire-bars slightly inclining upwards from the front, and an ordinary ash-pit below. A horizontal reverberatory arch is built immediately over the fire, and reaches from the front to the back of the furnace, which rises at an angle of about 45°, and forms a passage at the end of the arch, wherethrough the flaming products of combustion pass incliningly upwards in the direction of the back of the boiler into a heat chamber, the walls of which inclose all the heating surface of the boiler, and form the side flues.

The flaming hot draught is driven from the back to the front end of the boiler over the arch, where a current of air, regulated by a damper valve, is admitted. The exit flue near the front communicates with the chimney, wherein there is a damper valve for the purpose of regulating the draught.

The reverberatory arch is employed in the construction of puddling, and other heating furnaces, of which two modifications are shown and described.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1865, January 20.—N° 181.

NEWTON, William Edward.—(*A communication from Charles Michel Nillus, Ernest Ferdinand Nillus, Albert Emmanuel Nillus, and Jean Joseph Manlius Crouvés.*)—(*Provisional protection only.*) —This invention relates to steam hammers and pile drivers worked by steam or other power. The hammer carrier, which is hung on the bottom of the piston rod, is made hollow and surrounds the steam cylinder. Its interior communicates with the atmosphere by means of two or more openings, corresponding in height to nearly one-half the stroke of the piston. The air con-
d in the hollow carrier is compressed on the ascent of the
and a vacuum is prevented after its expansion by the ad-
of air through the openings. The air may be entirely
sed by the use of a suitable piston in the lower part of the

cylinder, and its dilation employed for driving the hammer back. This is an advantageous arrangement for pile driving apparatus. Any accumulation of water is driven off by the cushion of air through a pipe before the carrier has reached the end of the stroke. When the compressed air is utilized as described, a valve is adapted so as not to allow the pressure to become superior to the pressure in the steam cylinder, either by applying it upon the hammer carrier, or outside, in order to avoid vibrations, communication being established by means of a flexible tube.

A vertical fall is ensured for the hammer by means of grooves in the carrier, which are adapted to guides in the framing.

[Printed, 4d. No Drawings.]

A.D. 1865, January 21.—N° 183.

LESTER, Thomas.—This invention, relating to steam engines, consists, 1st, in increasing the size of the induction passages, which are so extended in width, as nearly to equal the internal diameter of the cylinder. 2nd. The connected end of the slide valve rod, is fitted with or made in the form of a ring, to rotate within which, is a transverse hollow axis, which contains a transverse shaft, the revolutions of which are coincident in time with the crank shaft by which it is driven. " Between the inner and " outer diameters of the ring there is sufficient depth of metal or " space to form thereon or affix thereto [cam studs or projections " with inclined curved surfaces on each side of the said ring, " one stud being at the top and the other at the bottom of the " ring. The end of the before-mentioned rotating axis or short " shaft which rotates within this ring carries one cam or tappet " on each side, which as this shaft rotates come into contact with " the inclined curved surfaces of the ring studs at the top and " bottom, and thus very rapidly raise and lower or move the ring " and valve rod up and down, the latter being stationary until " the piston in the cylinder arrives very close to the end of the " stroke each way. The axis which carries the rotating cams is " made of sufficient length to allow one of the cams to clear the " studs on one side of the ring while the other cam is rotating in " contact with the studs on the opposite side of the ring. The " axis slides upon its shaft upon a feather and is moved laterally " by a lever, so that the valve can be actuated by the cam and " studs on either side, their contact on the right giving the lead

“ in one direction and on the left in the opposite direction, the “ simple movement of the lever to the right or left being all that “ is required to reverse the engine.”

[Printed, 10*d*. Drawing.]

A.D. 1865, January 26.—N° 217.

PATON, William.—(*Provisional protection only.*)—The object of this invention is the production of a filamentous packing “ which can be modified to suit steam joints, stuffing boxes, “ pistons, or for other like uses. In making the packing for a “ circular steam joint, for example, a tube formed by plaiting flax “ or other suitable yarns or threads is cut to a length about “ double that of the ring for the joint when opened. This tube “ is doubled over upon itself so that the loose yarn ends are “ turned inside; this being done with both ends of the tube, so “ that the two sets of loose ends meet each other. The outer “ butt ends formed by this means are then stitched together, and “ the packing is worked into the form of a flat ring, and is saturated with red lead or other substance suitable for making the “ joint tight. This packing may of course be made square, or “ of other forms, according to the shape of the steam joint to be “ packed. If elastic packing for stuffing boxes, pistons, and the “ like is wanted, the rings of plaited yarns formed as hereinbefore described (but without the red lead) may be used, or “ rubber or other material may be inserted into them before “ stitching the butts together, to increase their elasticity or bulk. “ The rings may also be covered with wire gauze.”

[Printed, 4*d*. No Drawings.]

A.D. 1865, January 26.—N° 219.

ABEL, Charles Denton.—(*A communication from Louis Hippolyte Courtois Roubert.*)—(*Provisional protection only.*)—This invention relates to an apparatus for preventing deposits in steam boilers, the object being to facilitate the introduction into the boiler, of chemical and other fluid compounds, which previous to their admission are subjected to the action of steam.
apparatus consists of a closed spherical or other formed
disposed above the boiler, and connected thereto at bottom
s of a pipe, in which a stop-cock or valve is interposed.
o the upper part of the vessel is opened through a cock

or valve, superposed upon which is fixed a funnel to receive the fluid compound, which, when the cock is opened descends into the vessel, expelling the air contained through a valve at the top. Another pipe, provided with a stop cock, forms a steam communication between the upper part of the vessel and the steam space of the boiler. When the vessel is filled, the communication with the funnel is closed and the small steam pipe opened, which admits steam from the boiler to the upper part of the vessel. After the heat of the steam has had a due effect upon the fluid compound, it, when the bottom cock is opened, sinks down the lower pipe into the boiler, the steam pressure in the boiler and vessel being in equilibrio.

[Printed, 4*d*. No Drawings.]

A.D. 1865, January 27.—N° 243.

TWIBILL, Joseph.—This invention relates to that class of steam generators or boilers, which are composed of separate chambers, pipes, tubes, or cylinders, so jointed together, and inclosed by the furnace walls, that a continuous water current circulates through all the different parts of the apparatus.

The first modification described consists of an arrangement of a series of tubes inclining from each side of the furnace, so as to meet over the centre and form a triangular shaped chamber above the fire. The lower ends of these tubes are set, at a suitable angle, into longitudinal pipes, horizontally disposed along the sides of the furnace, and the upper ends of both series are set into a pipe directly over the centre of the furnace, which is inclosed by a sloping roof of tile or brickwork. The flaming products of combustion after playing all over the the surface of these inclining tubes, pass into a main heating chamber, which is covered in and contains several series of tubes, inclining at an angle in parallel rows, one series above another. All the tubes in a series communicate by means of longitudinal pipes, into which the ends of the tubes are respectively set, and all the longitudinal pipes communicate by means of other pipes, which are open to the furnace tubes in one direction, and communicate with a cylindrical vessel above, wherein the working water level is established, all the tubes and junction pipes being filled with water, which is constantly circulating through them. Above the cylindrical vessel is another of the same form which constitutes the steam chamber, and is fitted with the usual appliances of gauges and valves ; thence through suitable pipes the steam is carried off for use.

Several modifications, differing mainly in the manner of disposing and arranging the heating tubes and details, are shown and described.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1865, January 30.—N° 260.

DAVIES, GEORGE.—(*A communication from Pierre Jean Lacoste.*) —(*Provisional protection only.*)—This invention relates to the induction steam ways of steam engines, which are made as short as possible, in order to avoid condensation. “The steam which “ actuates the piston passes directly from the boiler to a circular “ slide valve, which presents only one direct opening. The “ steam is not divided by a throttle valve, nor by the large extent “ of the valve box, as occurs in ordinary engines. The cylinder “ has no ends, but is provided with two pistons and a partition “ in the centre of its length, and the steam is admitted direct “ into one or other of the compartments thus formed, that is to “ say, there are no steam passages. The stuffing boxes of the “ piston rods are dispensed with, and it is very easy to remedy “ any leakage of the pistons because it will be perceived imme- “ diately, and a handy workman might even rectify the same “ while the engine is in motion by simply turning two screws, “ the heads of which project, and which screws serve to expand “ the packing. The system of the governor applied to the engine “ also gives good results.”

[Printed, 4*d.* No Drawings.]

A.D. 1865, January 31.—N° 271.

HENRY, MICHAEL.—(*A communication from Auguste Bernier and Hyppolite Louis Godard Desmarest.*)—“ This invention refers “ to engines, carriages, and machinery to be propelled on land, “ such as locomotives, traction engines, portable engines, steam “ cultivators, and similar apparatus. Heretofore such apparatus
“ ve been propelled by applying power to the wheels on which
run, whereas according to the present invention the pro-
n of the engine, carriage, machine, or apparatus is effected
ns of levers, legs, or feet which have an alternating or

" rising and falling motion imparted to them by steam or other " power, and are so fitted and worked that at their down stroke " they apply their lower ends against the ground or surface to be " travelled over, and thereby move the apparatus in the required " direction. These levers, legs, or feet work in a manner some-" what similar to the propulsive action of the legs of a horse; " they may be jointed and curved or inclined as required." The legs, of which there are two sets for motion in either direction, are respectively worked by crank shafts, one set being raised whilst the other set operates.

[Printed, 8*d*. Drawing.]

A.D. 1865, January 31.—Nº 273. (* *)

FLETCHER, JOSEPH, and HAMER, DANIEL.—(*Provisional protection only.*)—"The application of hydro-electricity to steam " for the purpose of increasing its expansion and power, and the " machinery or apparatus connected therewith, and also the " application of galvano or frictional electricity for the same " purpose."

"In one arrangement for the application of hydro-electricity in " connection with steam for working steam engines, we place " between the cylinder and boiler a steam chest divided by a " partition into two compartments, and form in the partition a " number of holes, in each of which is placed a tube of iron. " The steam from the boiler passes from the first compartment " through these tubes, and comes in contact with steel points on " a number of insulated steel bars in the second compartment, " the effect of which is to set free a quantity of electricity which " combines with and expands the steam as it is passing onwards " to the valve box and cylinder of the engine. After this combi-" nation of steam and electricity has passed through the cylinder " it is exhausted through a number of tubes into a pipe or cham-" ber in which there are steel points and insulated steel bars for " setting free more electricity, which is returned by conducting " wires to the before-mentioned steam chest, and combines with " the next supply of steam and the electricity evolved therefrom, " and then the combination with encreased power passes to the " cylinder, and from thence to the exhaust with its tubes, points, " and bars, from which the electricity is again returned to the " steam chest, and so on continually, thereby obtaining an " encrease of *power*."

"When desired, instead of employing hydro-electricity, we
" combine the electricity evolved from galvanic batteries or from
" the ordinary friction machines with the supply and exhaust
" steam, and thereby obtain an encrease of power."

[Printed, 6*d.* Drawing.]

A.D. 1865, January 31.—N° 274.

COLQUHOUN, EWING PYE, and FERRIS, JOHN PARDOE.—This invention relates to lubricating apparatus for steam engine purposes, which acts by condensation, and only when under steam pressure. "The body of the lubricator contains a chamber for
" the reception of oil; passing through this chamber is a tube or
" passage, through which the steam travels, and condensing falls
" into and among the oil, which is thereby displaced and forced
" down the tube to the part to be lubricated. When all or any
" portion of the oil has been consumed, the chamber will be
" found to contain a volume of water equal to the displacement
" of oil; this water, which naturally falls to the bottom, can be
" released by the screw tap at the lower part of the lubricator.
" The upper portion of the lubricator is furnished with a cock,
" so arranged that the oil chamber can be readily filled or so
" adjusted as to dispense a greater or less quantity of oil, or
" suspend lubrication entirely."

[Printed, 6*d.* Drawing.]

A.D. 1865, February 3.—N° 305.

WESTERBY, JOHN.—(*Provisional protection only.*)—This invention relates to apparatus for preventing the explosion of steam boilers, and in so fixing such apparatus within the boiler, that it cannot be tampered or improperly interfered with. An opening is made in the upper part of the boiler to communicate with one end of an elbow pipe fixed inside, which pipe at the other end is closed by a double equilibrium valve. This valve is attached to a lever, which at one end is, by means of a rod, connected to a submerged float, and at the other to a counterbalance weight, the point of attachment of the valve rod being between the fulcrum and the float rod, in order that when the water level sinks, the valve may be opened by the descent of the float. The escape pipe which covers the opening may be carried up to any convenient height. No alarm whistle is required.

[Printed, 4*d.* No Drawings.]

A.D. 1865, February 4.—Nº 311.

HILLS, Frank Clarke.—This invention relates to effecting the combustion of coal in steam boiler and other furnaces, and of gas by gas burners, by means of heated air, instead of employing the atmosphere at its ordinary temperature, the air necessary to support combustion being heated during its passage to the ash-pan, or gas burner, by that which is in most cases waste heat.

As applied to a locomotive steam engine, the smoke box should be enlarged, and the boiler tubes elongated, so as to project through the tube plate into the smoke box, wherein, inclosing the projecting tubes, is a chamber formed by a second tube plate which receives the ends of the tubes. Into this chamber the air is admitted from above, is heated whilst passing amongst the tube ends, and is drawn downward through a passage under the boiler into the ash-pit, which is otherwise closed. A little water may be admitted to the ash-pit to cool the fire-bars, which are V shaped, and filled with fire-clay, or instead of water, a jet of waste steam may be introduced into the ash-pit. The blast pipe is arranged in the smoke box as usual. A modification of the smoke box arrangements is shown and described.

When the invention is applied in the construction of stoves, the air introduced under the fuel comes through an outer casing which surrounds the stove and forms the ash pan.

The air which supports the combustion of jets of gas from gas burners is by means of two concentric glasses, heated whilst passing upwards into the flame, no other air being admitted from beneath the burner. The inside glass should be considerably higher than the outside one, which should be of such diameter as to leave a small annular space between.

[Printed, 1*s* 4*d*. Drawings.]

A.D. 1865, February 6.—Nº 331.

WATTS, John Isaac. — (*Provisional protection only.*)—This invention relating to apparatus to be worked by compressed air for obtaining motive power, consists in the employment of two cylinders of equal size, one serving as the working cylinder, and the other to compress the atmosphere, which passes thence into two receivers, interposed between the two cylinders, and communicating respectively with the ends of the working cylinder through *suitable passages* governed by slide or other valves actuated by an eccentric on the crank shaft. "The working piston "rod slides freely during a portion of its stroke through a "reciprocating guide block, which is connected by a connecting "rod to a crank on the main driving shaft, the throw of such "crank being about three times greater than the stroke of the "piston. A second crank of the same throw as the first, and at "right angles thereto, is also formed upon the main shaft, which "crank gives motion by means of a connecting rod to the longer "end of a horizontal lever, the shorter end of which lever is "connected to the compressing piston." The crank only at the commencement of each stroke is acted upon by the working piston, by means of two fixed stops on the piston rod, the remainder of the throw of the crank being effected by the momentum of a large fly wheel fixed on the shaft, the guide block meantime sliding along the piston rod between the fixed stops.

"In starting this engine an air pump is employed for charging "the receivers with air at a sufficient pressure to start the piston "of the working cylinder; but so soon as this piston begins to "move it transmits motion through the main shaft and horizontal lever to the piston of the air compressing cylinder, which "thenceforth" is expected to keep up the supply of compressed air requisite to work the engine.

[Printed, *4d*. No Drawings.]

A.D. 1865, February 7.—N° 338.

LUNGLEY, CHARLES.—This invention of "improvements in "steam engines" applies to those engines which (as stated by "the inventor) "are in part worked at high pressure, and are "fixed to the boiler on a separate bed plate, and with a con"denser attached so as to constitute part of the bed plate, the "shaft being solid so as to form the excentrics for working the "air pumps and such other parts of the engines as may be "required. I forge the intermediate or other parts of the shaft "of oscillating and other engines with solid excentrics on the "shaft, and thus do away with the expense and risk of cranks on "shafts. This is applicable to all kinds of engines, and is in"tended to dispense with the cranks, which are so liable to "break; I also work the air pumps from the piston rod, and "supply the boiler direct from the condenser, thereby diminishing "*all the before*-named working parts and simplifying the general

" working of the engines. For this purpose I fit a cross head to
" the end of the connecting rod extending to the outside of the
" guides, and to this I attach the air pump on one side, and the
" circulating pump on the other. The air pump in this case acts
" as a feed pump, and pumps direct from the condenser to the
" boiler.

[Printed, 8*d.* Drawing.]

A.D. 1865, February 7.—N° 345.

LAKE, John.—This invention relates to steam generators, and more particularly to stationary boilers. The drawing attached exhibits a horizontal cylindrical boiler, with steam dome and four flue tubes, against which the furnace, which is rectangular and formed of double metal casing, is fitted. The space between the inner and outer casing is filled with water in communication with the water in the boiler. A large door is fitted to the front of the furnace for the purpose of clearing deposit out of the flue tubes, and the fire-door is fitted beneath. A plug valve is fitted into the back end of each flue tube, for the purpose of regulating the air draught, and more or less confine the heated gases and products of combustion in the flues, before they are allowed to pass off to the chimney. The furnace casing is inclosed in brickwork, and the body of the boiler, which rests on transverse sleepers, is enveloped in a thick coating of felted or other non-heat-conducting material. Arrangements are made for opening the back plug valves from the front by means of a lever and chains, which pass over pulleys and are connected to bell crank levers which carry the valves.

Modified details are shown and described.

[Printed, 10*d.* Drawing.]

A.D. 1865, February 10.—N° 375.

RAMSBOTTOM, John.—The object of this invention, relating to machinery for rolling and hammering metallic substances, is to provide against such accidents as the fracture of the "breaking "spindle," and other injury to the machinery when the strain upon the rolls is greater than the driving shaft can bear. For this purpose, in lieu of the "breaking spindle" other apparatus is employed, respecting which two modifications are described. The first acts by the friction or pressure on wood blocks disposed between the surfaces of a metal disc and a plate, which are brought together by bolts, one surface being fixed upon the end of the driving shaft, and the other upon the machine axle. The second consists in attaching the driving to the driven part of the apparatus by bolts, which yield to and are cut through transversely by the lateral pressure of the edges of the holes which contain them at such time, when the strain on the rolls is greater than the bolts are calculated to bear.

The invention also consists in supporting the hammer blocks of duplex steam hammers on toothed sectors or rockers, instead of on wheels as described by the inventor in the Specification of a prior patent, dated April 13th, 1863, No. 924, in order that the unequal wear caused by the partial imperfect rotation of the wheels at each stroke of the hammer may be prevented, "for it is " evident that by making the quantities of metal above and below " the axle in the inverse proportion to the quantities of motion " of the parts, the momentum of the sectors will be in a great " measure counteracted."

[Printed, 8*d*. Drawing.]

A.D. 1865, February 11.—N° 395.

CASS, JOHN.—This invention relates to boilers, furnaces, and to apparatus for regulating the flow of steam, and consists of—

1st. Various arrangements in furnaces interior to boilers which are described for economizing fuel, reducing wear and tear, and—

2nd. For supplying heated air to furnaces. Hollow fire-bars with fluted, grooved, or serrated upper surfaces are used in horizontal boilers with internal furnaces. The atmosphere enters through an aperture under the front end of each bar, and passes out of the rear end of the bar into a hollow bridge, and thence, through perforations in its upper surface, to mingle with the flaming products of combustion in the flues. The dead plate in front is also perforated for the admission of air into the furnace. The direct course of the fire draught in the tubular flues is interrupted at intervals by hollow chambers, having conical or other formed perforated fronts, through which, by means of pipes arranged in various ways in the flues and spaces of the boiler, so as to communicate with the atmosphere externally and heat it in its passage through them, fresh streams of air are admitted to *promote* combustion, generate heat, and prevent smoke. An air *pump is sometimes* employed to force the air through the pipes, and also to draw off the heat and vapour from the exhaust steam pipe and top of the condenser, and force them into the boiler and furnace. The side flues are channelled at top, so as to cause the fire draught to take an upward course and impinge upon the sides of the boiler.

Some boilers are constructed with three internal flue tubes, and the furnace is disposed beneath. The hot draughts are directed, first, under the boiler to the uptake at the back, returning through the lower flue to the front, and thence back to the chimney flue through the two upper flue tubes. These boilers are supported on hollow iron legs or standards, which receive the sedimentary deposits.

3rd. Boilers are constructed with plates of sufficient length to extend round the whole circumference, the two ends nearly meeting are jump jointed and rivetted to longitudinal joint plates, and the sides are jointed in the same way and rivetted to welded joint rings with two or more rows of rivets. At the top of the back flue of one boiler, or across the back flues of a range of boilers a water cistern is disposed, and the water therein becoming heated is used for feed water. Other modifications in the construction of steam boilers are shown and described.

4th. For regulating the flow of steam or reducing its pressure, a box or chamber divided by a horizontal partition into two compartments is employed, and by means of pipes one compartment is put into communication with the boiler, and the other with the engine. Through the partition there are two openings which are closed by two valves, one on each side, so that the two act together as an equilibrium valve. The valve spindles respectively are connected to the opposite ends of an equally balanced lever, one end of the lever being also connected to the rod of a piston working in a small inverted cylinder fixed on the top of the valve chamber; the valve attached to that end of the lever being weighted to the reduced pressure required.

When employed to regulate the speed of a steam engine, the small piston rod is, by means of suitable appliances, acted upon by the governor.

[Printed, 3*s.* 4*d.* Drawings.]

A.D. 1865, February 13.—N° 401.

THOMSON, ROBERT WILLIAM. — This invention relates to *vertical steam boilers, and is* contained within a cylindrical shell.

A central furnace covered in by an annular tube plate occupies about two-thirds the height of the boiler. The lower ends of a circular series of vertical tubes are set into and rise from the tube plate through the water and steam space above, and open into the uptake through the top of the boiler. A large spherical vessel occupies the upper central space in the furnace, and closes the central opening in the annular plate, around the inner rim of which the upper part or edge of the vessel is rivetted. The annular space left between the bulk of the spherical vessel and the furnace sides is very narrow, so that after the flaming gases have passed under the lower half of the vessel, and the lower part of the furnace sides, they are caused to impinge more intimately upon the metallic surfaces while passing up through the narrow space towards and through the vertical tubes to the uptake above. A proper circulation is kept up in the vessel by means of a pipe, which forms a communication between the lower water space of the boiler and the bottom of the vessel. The invention is more particularly applicable to steam boilers of comparatively small size.

[Printed, 8*d*. Drawing.]

A.D. 1865, February 14.—N° 410.

GRESHAM, James.—This invention is applicable to "Giffard's "Injector" and similar apparatus in use for feeding steam boilers, and raising and forcing fluids. By its aid the necessity, when the feed water is more than five feet below the apparatus, for charging the suction pipe and keeping it supplied until the injector begins to operate, is removed.

1st. It "consists in arranging charging apparatus so as to over-"come the difficulties above referred to by causing the charging "supply to descend and enter at the lowest point of the suction "pipe above the foot valve; by this means upward motion is given "to the entire column of water in the suction pipe, consequently "there is no tendency to break the continuity of the jet in the "sudden effort to impart motion to the column of water in the "suction pipe when the charging supply is cut off, as is the case "in the charging arrangement hitherto used."

2nd. "Relates to a method of charging the injector by drawing "the feed water or liquid up the suction pipe of the injector "*sufficiently* high to enable the injector to start into operation, at

" which time the action of this apparatus is dispensed with; and " this part of my invention consists in creating a partial vacuum " by means of a steam or other fluid jet or current; the chamber " in which the partial vacuum is formed being brought into com- " munication with the feed or suction pipe of the injector. The " manner in which I prefer to carry this part of my invention " into effect is by surrounding a branch pipe from the overflow " cavity of the injector with a larger pipe or funnel, and arrang- " ing an annular space between the outside of one and the inside " of the other pipe for the steam or other jet. . . . In working an " injector having this apparatus applied thereto or combined " therewith the jet for lifting the feed is first turned on, then the " injector is brought into operation in the usual manner, and " when this has been accomplished the lifting jet is turned off, " and the injector continues to work."

[Printed, 10*d.* Drawing.]

A.D. 1865, February 14.—Nº 415.

BATHO, William Fothergill.—This invention relates to expansion gear for steam engines, the object of which, it is stated, " is the ready adjustment of the slide or valve for cutting off the " steam from the cylinder according to the requirements of the " load whilst the engine is working. For this purpose I employ a " loose eccentric carrying a short shaft, having cut on it a worm " working in a worm wheel keyed on the crank shaft of the " engine. To the said short shaft is fixed a spur wheel or pinion " gearing into another spur wheel or pinion fixed on an inter- " mediate shaft which carries a bevil pinion gearing into two " bevil wheels, one loose on the crank shaft and the other loose " on the boss of the eccentric." " The operation of holding the " bevil wheels may be effected by suitable hand gearing so as to " cut off the admission of steam to the cylinder at any part of " the stroke of the piston, or the governor may be made to ope- " rate on this apparatus by means of fricton brakes or otherwise, " in order to regulate the admission of steam to the cylinder " according to the load on the engine."

[Printed, 8*d.* Drawing.]

A.D. 1865, February 16.—Nº 443.

WILSON, Edward Brown.—This invention, relating to the *construction of furnaces,* is supplementary to former Letters

Patent granted to this inventor, bearing date October 3, 1863, No. 2425. Since that time the inventor has discovered that the efficiency of furnaces is considerably increased by exposing a long inclining bank or surface of burning fuel, whence the flaming gases and hot products of combustion are carried into the flues, instead of the short length or small area of fire-bed or burning surface of fuel formerly described.

The fuel is fed into the furnace, which is kept constantly filled, by means of a hopper, or covered opening inclining upwards towards the front above the fire-bed, and the air necessary to support combustion passes down through the fuel in regulated quantity. The bottom of the furnace is formed of fire-brick, and the long sloping surface whereon the fuel is consumed is of the same material. A curved deflector of refractory material forms the upper side of the furnace and curves downward towards the bridge, so as to bring the visible and other products of combussion into contact with the incandescent portion of the fire-bed, and also form an aperture of a suitable size for the passage of the burning gases into the flues. Openings are provided for the instruments ordinarily in use, for occasionally raising and loosening or breaking up the mass or bed of fire, and for clearing out the ashes. Detailed arrangements for applying the invention to locomotive and Cornish boilers, and to puddling and other furnaces are shown and described.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, February 18.—N° 468.

JONES, JAMES GRAFTON.—This invention relates to the construction of beam engines. Instead of "applying the piston rod
" to and connecting it wi [illegible] d of the beam in the usual
" manner, the steam c [illegible] of a single or double
" acting engine, is mo [illegible] oves with the beam; and
" the piston rod, when [illegible] ng engine, is connected
" with a weight which [illegible] orking of the engine to
" be moved in a direct [illegible] axis of the beam; but
" when a double-acti [illegible] then the piston rod is
" caused to pass thro [illegible] ffing box at each end
" of the cylinder, and [illegible] weights, one on each
" side of the axis of [illegible] ferred that the steam
" same should be [illegible] he beam and above its

"axis, and that the beam beyond the axis should be formed with "a track suitable for receiving a weight, and it is desirable that "the weight or weights used should be of a cylindrical form, and "caused to roll or revolve when moved to and fro on the track." The invention is capable of being worked by compressed air, water, or other fluid.

[Printed, 10*d*. Drawing.]

A.D. 1865, February 18.—N° 473.

ALLEYNE, John Gay Newton.—This invention relates to the construction of puddling furnaces, and to generating steam in boilers by means of the heated gases and products of combustion which issue from the puddling furnace flue.

1st. Constructing puddling furnaces having a rotating and "removeable bed, in which the rotary motion of the bed is "obtained by means of a revolving table beneath the bed, on a "level with, or above or below, the floor of the mill."

2nd. "Constructing mechanical puddling apparatus, in which "the rabble or stirring tool is carried by a framing separate from "the furnace, and arranged either stationary or moveable, the "upper portion of which framing carrying the rabble receives a "reciprocating motion, while the to-and-fro motion of the rabble "is obtained by means of rocking levers or cranks carried by the "said framing."

3rd. "Puddling apparatus in which the rabble or stirring stool "is carried by a framing or carriage receiving a rectilinear reciprocating motion in a line parallel or nearly so to the puddling "furnace, while the rabble receives a to-and-fro motion at right "angles to that of the framing by means of cranks or rocking "levers carried by the framing."

4th. "Puddling apparatus, in which the rabble . . . is carried "by a framing or carriage capable of receiving a rectilinear "to-and-fro motion, while the rabble receives both a rectilinear "to-and-fro motion upon the framing and a lateral reciprocating "rotary motion, either together with the upper part of the framing, ... or by causing the bed upon which the framing "moves to vibrate upon an axis."

5th. "Combining mechanical puddling apparatus, in which the rabble . . . has a rectilinear to-and-fro motion imparted to it, with puddling furnaces having rotating beds."

6th. " Constructing steam boilers for utilizing the waste heat " of puddling furnaces, in which the vertical part into which the " gases issue from the furnace is provided with pendent water " tubes, while the horizontal part is constructed with fire-tubes " similar to a locomotive boiler."

7th. Constructing steam boilers for utilizing the waste heat from puddling furnaces having internal flues with corrugated surfaces.

Two Letters Patent granted respectively to Jacob Perkins, July 2, 1831, No. 6128, and to W. E. Newton, June 15, 1857, No. 1671, are referred to.

[Printed, 2*s*. Drawings.]

A.D. 1865, February 21.—N° 485.

SWANN, John Russell.—(*Provisional protection only.*)—This invention relates to steam engines. Two rotating valves are employed at each end of the cylinder, one for the induction, and the other for the emission of the steam. "These valves are hollow " cones, fitted in suitable cases; each cone has a passage through " it on one side, and there is a corresponding passage in the case; " when these passages are brought to correspond with each other, " the steam passes from the interior of the cone outwards through " the case. The valves are caused to revolve continuously in one " direction by spur gear or otherwise. From the exit valves the " steam passes into a casing which surrounds the cylinder, and " thence away; thus the cylinder is steam jacketed." The top and bottom or plates of the piston are perforated to admit steam, which presses divergently at the back or inner surface of the two split packing rings, whereby they are expanded and caused to press against the sides of the cylinder.

[Printed, 4*d*. No Drawings.]

A.D. 1865, February 22.—N° 493.

HULLEY, Jasper.—This invention relates to boilers for heating purposes, and for generating steam, and consists in so forming boilers to be used for heating purposes in separate sections of cast iron, that when brought together and the joints properly caulked and cemented, suitable flues for the passage of the fire draught, and suitable chambers connected together by means of bends or otherwise, are formed for the water, which circulates through hollow fire-bars of cast-iron, and is distributed at an equable temperature through the chambers and in various directions by means of branches arranged at a uniform level round a dome with which the boiler is surmounted.

Boilers for generating steam are internally constructed in the same manner of separate pieces or sections which, when arranged and fitted together, form the necessary internal flues, and the water, and steam spaces; these are inclosed by a wrought-iron shell, to which the internal details are properly secured. All the separate parts and sections may be of wrought iron or copper fitted together, due regard being paid to providing ready means of access to the inner parts, for the purpose, when necessary, of cleaning out deposits from the water spaces, and soot and ashes from the flues.

[Printed, 10*d.* Drawing.]

A.D. 1865, February 22.—N° 496.

NEWTON, William Edward—(*A communication from James Rankin.*)—(*Provisional protection only.*)—This invention relates to a steam engine slide valve, so balanced as to work as freely under pressure as it would in the open atmosphere. "This object is " obtained by combining with the valve a small cylinder in which " works a piston, and through a series of intervening levers, " rockers, and links, the upward pressure of the steam on the " piston is made to couterbalance the downward pressure on the " back of the valve, and the valve is therefore perfectly balanced. " The bottom of the valve chest forms the seat for the slide valve, " and a reciprocating motion is imparted to this valve in the " usual manner. From the back of the valve rise two lugs which " form the bearings for the fulcrum pins of the lever which is sup- " ported by the pins at about the middle of its length. One end " of the lever is provided with a notch which rests upon the " upper end of a rocker that is stepped in suitable bearings on " the bottom of the valve chest. The opposite end of the lever " is suspended from a link which is connected by a pivot with a " lever, one end of which rests upon a knife edge bearing which " is rigidly connected to the side of the valve chest, whereas its " other loose end extends through a slot in the piston rod. This " rod extends from a piston which is fitted into a cylinder sup- " ported by the top of the steam chest, and open at its inner end.

" An aperture in the top of the cylinder forms an escape forth at " portion of steam which may pass the piston. If steam is " admitted to the steam chest it forces the piston up and the " valve down, and the connection between the piston and valve " and the areas of the parts are so proportioned that the upward " pressure on the piston just balances the downward pressure on " the valve. At the same time the valve is allowed to move freely " on its seat." The pressure on the valve " can be easily regulated " by changing the position of the pin which connects the link " with the lever."

[Printed, 4*d*. No Drawings.]

A.D. 1865, February 22.—N° 501.

BOULTON, Matthew Piers Watt.—This invention relates to obtaining motive power from aeriform fluids and liquids. " When " it is desired to heat air or aeriform fluid in a close vessel under " pressure this may be done by forcing into the vessel heated " matter in a state of fusion, which may be injected into the " vessel in numerous small jets or streams. The matter thus " employed may be a metal or metallic alloy in a state of fusion. " Or it may be some compound of a metal with non-metallic " elements such as metallic oxides," salts, silicates, carbonates, or such like mixtures. " Also, the aeriform fluid may be " caused to pass through the heated liquid, receiving heat in its " passage through." The valves and cylinder of the engine employed may be kept cool, by passing currents of cold water through and around them.

This method of heating may be employed to generate and superheat steam for the production of motive power. Petroleum or other substance, is caused to traverse numerous tubes exposed to heat, and the combustion of the gaseous products employed to work an engine; and steam commingled with heated products of combustion is used to act upon a piston or otherwise.

Mechanical arrangements for realizing the proposed improvements are described and illustrated, including the method of using in successive blasts, heated air or steam, the temperature of which is too high for practical purposes in a cylinder, until mixed with the atmosphere, when it is employed to work a piston in a cylinder.

[Printed, 1*s*. Drawing.]

A.D. 1865, February 24.—N° 516.

JACOB, Joseph and PILZINGER, Rudolph.—This invention relates to heating steam boiler and other furnaces, by causing the products of the combustion of solid fuel, to mingle with hydrogen or other gas, combined with jets of superheated steam, and currents of either cold or heated air. The gas may be obtained from blast furnaces, the dry distillation of coal, or from petroleum or other inflammable fluid, so introduced as to fall in drops from a pipe upon the burning fuel, or the fuel may be saturated with the fluid before its introduction to the furnace.

As applied to an ordinary steam boiler; the furnace is constructed in front, and is fed in regulated quantities from a closed hopper above. The burning fuel is supported upon a sloping range of movable fire-bars, the lower end of each alternate bar being by turns raised and lowered by means of a transverse cam shaft, for the purpose of loosening the fire mass. The products of combustion rise from the furnace into a combustion chamber, and on the passage thither are brought into contact with the currents of air and gas. The superheated steam issues in jets into the combustion chamber, where it intimately mingles with the inflammable compound, which burns with more or less intense heat, the flaming products being carried into the flues, and over the heating surfaces of the boiler. When a blast is used, an air passage surrounds each steam jet, whereby the air and steam are mixed while entering amongst the burning gases in the combustion chamber. The constructive details require modifying to suit general purposes.

[Printed, 10*d*. Drawing.]

A.D. 1865, February 24.—N° 521.

ORAM, William.—(*Provisional protection only.*)—This invention relates to arranging the position of hydraulic press pumps in connection with steam engines, and "consists in arranging two " pumps, one at each end of the steam cylinder and piston, and " attaching the plunger of one pump to the cross head at the end " of the piston rod, a forked connecting rod being employed " between the cross head and the crank shaft, so that the pump " may occupy the space between the fork, and in a direct line " with the steam cylinder. The plunger of the other pump is to " be attached *to the end of* an extended part of the piston rod

" passing through a stuffing box in the opposite end of the " cylinder, so that one steam cylinder and piston placed directly " between the two pumps works them both, which arrangement " and double coupling constitutes the feature of the invention."

[Printed, 4d. No Drawings.]

A.D. 1865, February 24.—N° 522.

HOWARD, James.—This invention relates to steam engines for agricultural purposes. The steam cylinders are mounted on one end of the boiler, which contains, about its mid-length, a furnace transversely disposed; at each end of the boiler there is a smoke box, connected with the furnace by longitudinal flue tubes; other flue tubes conduct the hot draughts from the end smoke boxes respectively to a central chimney, wherein, immediately over the furnace, the steam dome is situated, whence the steam is conducted to the cylinders through pipes disposed along a heated flue. The winding drums are mounted at the opposite end of the boiler upon a longitudinal shaft, which rests in eccentric bearings attached to the boiler shell; by turning the shaft, the drums can be thrown out of gear. In order to resist the lateral strain of the rope whilst winding on, the periphery of the steering wheel is furnished with segmental blades, which enter the ground and prevent any lateral displacement of the engine.

[Printed, 10d. Drawing.]

A.D. 1865, February 27.—N° 549.

SIM, William.—This in an invention of apparatus for obtaining gas from mineral oils, and for employing the same for illuminating and heat producing purposes.

As applied to generate steam in a single flued horizontal cylindrical steam boiler, a retort is disposed in that part of the flue of the boiler which constitutes the furnace. The transverse section of this retort is in the form of a horse-shoe, the two limbs resting respectively upon the side plates of the narrow fire-grate, along sides of the furnace, so that an arched combustion chamber or is formed above, between the outside of the retort and the er of the furnace. The outer shell or surface of the retort forated to receive a multitudinous arrangement of "Bunsen ters," and a small pipe in connection with a reservoir, con- *inflammable* fluid into the retort, wherein along the inner surface over the fire there is formed a shallow trough, into which, through perforations along the pipe, the oil is deposited in fine streams or drops. The retort incloses the fire-bar surface, and is heated by an ordinary coal fire fed from the front end. The gas evolved in the retort issues in jets through the numerous burners, and is burnt in the external combustion space; the flames radiating from the burners strike first against the surface of the flue, and are then carried into the boiler tubes, combined with the products of combustion from the coal fire, the air necessary to support the combustion of the gas being admitted to the combustion space in regulated quantities, and to the coal fire in the ordinary way through the fire-bars. Modified arrangements, applied to locomotive and other boilers are shown and described.

[Printed, 1s. 4d. Drawings.]

A.D. 1865, March 2.—N° 582.

HETHERINGTON, John Muir.—(*Provisional protection only.*—This invention relates to jointing together the parts of steam generators by introducing between the metallic surfaces "an " angle-shaped ring made of lead, copper, or other suitable metal " or alloy of metal, one portion of which ring fits between the " flat surfaces of the joint, and the other within a recess or " shoulder at right angles thereto, so that when the surfaces are " tightened together a perfect steam and water-tight joint is " formed against both angles of the packing." The "invention " may be modified by cutting recesses in the flat surfaces of the " joint, and in placing a double ribbed metallic packing in the " recesses and between the flat surfaces, or the metallic packing " may fit only within the recesses, and the flat surfaces, when the " joint is tightened up, abut together or form a jump joint." The invention may also be employed in fixing to boilers the steam and other pipes and mountings.

[Printed, 4d. No Drawings.]

A.D. 1865, March 2.—N° 584.

HOPKINSON, Samuel, and HOPKINSON, Edwin.—(*Provisional protection only.*)—The object of this invention, which consists in applying heated air in furnaces to the flaming products of combustion, is for the purpose of consuming the smoke.

As applied to a flued boiler, the inventors say, "At the extreme " end from the fire, we place two rectangular iron chambers in " a horizontal position parallel to each other and at some distance " apart. These chambers communicate with each other by means " of rows of pipes, the numbers of which vary according to " circumstances. To the upper chamber a stack or funnel is " attached communicating with the outer air. From the bottom " chamber a pipe extends into the flue nearly to the bridge. The " flange of this pipe at the bridge end is made large to fill the " bottom part of the flue, and extends somewhat higher than the " bridge, the top of the flange being flat. A hole or holes of " requisite size are made in the flange for the emission of air. " Directly over the bridge we place a casting, the upper part of " which fits the top and side of the flue, the lower part resting " upon the bridge. This casting is hollowed out, and presents a " semicircular aperture."

" Air descending the stack or funnel in passing through the " chambers and pipes becomes heated. On emission through the " hole or holes in the flanged end of the pipe near the bridge " it meets with the flame coming through the contracted aper" ture before named, and mingling with it consumes the smoke " entirely or nearly so.

[Printed, 4*d*. No Drawings.]

A.D. 1865, March 3.—N° 597.

MANWELL, DAVID, and MANWELL, JAMES.—This invention relates to a mode and apparatus, operated by steam power, for driving piles. The apparatus comprises an upright framing, which consists of two vertical guide frames in front for guiding the falling metallic mass or driver. The guide frames are supported in position by inclining shore pieces at back, and together at their vertices they carry the pulley frame and chain pulley. The lower ends of the guide frames and of the inclining shore pieces, are fixed to a horizontal foundation frame carriage, which is mounted on wheels for moving on rails laid along the intended direction of the line of piles, and a steam winch is fixed on the foundation frame. This winch is actuated by the piston rods of two steam cylinders, placed respectively to act on the ends of a crank *shaft*. This shaft carries the driving pinion, which gears into a *spur wheel* mounted on the axle of the winding barrel. The driving metallic mass weighs about three tons, and the engines worked at 60 lbs. pressure make 120 strokes per minute.

In making, in accordance with the invention, the necessary preparation for driving a row of piles, a number of main piles are first driven at measured intervals along the line, so as to form a series of interspaces or bays, each bay being of sufficient width to receive five piles, which are afterwards driven by the apparatus at one operation. The shoe is made sufficiently long to receive the lower ends of five piles, which are brought into position and fixed together by a frame which embraces the top ends, and they are kept in line by dowels between the contiguous sides of the piles, and by dogs on the face of the group. The piles, prepared in groups of five, are placed in position in the bays and driven simultaneously, the face of the driver being made sufficiently wide to operate on all. The main piles form guides for the groups, which are driven with comparative ease and certainty.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 4.—N° 607.

JOHNSON, John Henry.—(*A communication from Henry Brown.*)—This invention relates to the construction of a cylindrical rotatory steam generator, with hemispherical ends, to which hollow projecting cast-iron axes are attached. It is enclosed in a metal casing, which is lined with fire-brick. It is heated by a range of four furnaces along one side, opening through the casing, the fire-bar surface extending underneath to about the centre. A series of openings, closed by caps, is formed along the top of the casing for the purpose of admitting cold air to the top of the boiler, when from any cause it ceases o revolve. The steam and water feed pipes enter through the hollow axis at one end, the former curving upwards into the steam space, and the latter downwards towards the bottom. The cylindrical portion of the boiler is longitudinally divided into seven radiating sections like the divisions caused by the spokes of a wheel. The plates which form the radiating sides of the sections are corrugated, and form between the sections a converging series of flues, which communicate with a central tube, into which the products of combustion pass, and thence through the other axis into the chimney flue. The corrugation of the plates serves instead of stays to strengthen the construction.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 4.—N° 613.

HUMPHRYS, Edward.—(*Provisional protection only.*)—This invention relates to combining marine steam boilers, applicable in ships of considerable breadth of beam, and of large tonnage. It consists in arranging a set of "boilers in three rows in a direction "fore and aft the ship. The boilers of the central row are "double, that is to say, they have furnaces and fire-doors on each "side, so that the 'firing' takes place on both sides. The boilers "of each of the other rows are single, that is to say, they have "furnaces and fire-doors only on one side, viz^t., the side opposite "the central row of boilers." . . . . . . "In place of having "coal bunkers between the sides of the ship and the backs of the "two rows of boilers, it is preferred that such coal bunkers should "be away from the backs of such boilers, in order that the two "gangways or passages between the three rows of boilers may be "as wide as possible, not only to give the stokers as much space "as may be, but also to facilitate the bringing of coals into these "passages or gangways. The uptakes or flues of the boilers of "the side rows are carried over the passages or gangways between "the three rows of boilers, and they are connected with those of "the central rows of boilers. The steam pipes also of the boilers "of the side rows of boilers are connected with the steam chambers of the central row of boilers, dampers and stop valves "being used to shut off any one or more of the boilers from the "others."

[Printed, 4*d*. No Drawings.]

A.D. 1865, March 7.—N° 634.

BROOMAN, Richard Archibald.—(*A communication from Louis Felix Meunier.*)—The main features of this invention, relating to tubular boilers, consist in "the form of the fire-box, "its connection without any frame to the body of the boiler, the "arranging of the tubes in such manner that a man can gain "access to the interior of the boiler both above and below the "tubes to clean them, and the providing" stationary boilers with a return outside flue.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 7.—N° 641.

DODGE, James.—(*Provisional protection only.*)—The object of *this invention*, which relates to steam hammers applicable to the manufacture of files, parts of cotton machinery, and to other purposes, is to provide the means whereby the workman can at pleasure suspend and regulate the fall of the hammer. To this end a catch is employed which passes under the hammer when the latter is elevated, and will maintain it in that position until the catch is removed. This is effected by means of a treadle or lever which at the proper moment is pressed down by the workman. The provisional specification of an invention relating to the manufacture of files, lodged by this patentee and dated November 4, 1864, No. 2729, is referred to as a process to which the present invention is particularly applicable.

[Printed, 4d. No Drawings.]

A.D. 1865, March 8.—N° 643.

DEAN, JOHN.—This invention relates to regulating the speed of marine steam engines in rough weather, when by the pitching or rolling of the vessel, the screw propeller or the paddle wheels are sometimes partially or wholly out of the water, or in the case of paddle wheels, at times considerably submerged, whereby the resistance is constantly varying, and consequently also the speed of the engine. In order to maintain a uniform speed, a vertical cylindrical vessel is placed on each side in the hold of the ship, if propelled by paddle wheels, or towards the stern, if propelled by a screw. In each vertical cylinder there is a float, and an open communication with the sea-water outside, and in accordance with the altering positions of the ship, so the water in the cylinder rises or falls, thereby giving up and down motion to the float, the vertical rod of which is, by means of rods and levers, in correspondence with the throttle valve.

[Printed, 10d. Drawing.]

A.D, 1865, March 8.—N° 647.

WISE, FRANCIS.—(*A communication from William Bolivar Davis.*) —(*Provisional protection only.*)—This invention, which relates to packing for piston and other rods, consists of a body or cord of canvas or other texile or fibrous material, centrally containing a rubber core, which according to the desired form of the packing, (either round or square,) must be shaped to correspond. Outside the fibrous covering, a fabric composed of fine wires is woven, interlaced, or braided, which constitutes a compact durable metallic surface capable of yielding to compression. This wire covering may be worked thereon by an ordinary whip plaiting or braiding machine. The packing thus prepared is disposed in coils in the stuffing box, and secured in the usual manner. As the metal surface wears, the packing may be taken out and redisposed, so as to present a new wearing surface. The rubber core, if desirable may be dispensed with.

[Printed, 6*d*. Drawing.]

A.D. 1865, March 8.—N° 651.

CLARK, WILLIAM.—(*A communication from Auguste Gerin.*)—(*Provisional protection only.*)—This invention relates to a rotatory engine, wherein is combined the rectilineal to-and-fro motion of sixteen single-acting pistons, which work in cylinders, circumposed at an acute angle to the radius, round a disc, which revolves on a central axis. The rods of these pistons act diametrically in pairs, by means of connecting rods, the ends of which are jointed to the ends of the piston rods, so that the outward strokes of the pistons, as they each in succession arrive at one point in the revolution, lift the pistons to which on the opposite side of the axis they are respectively coupled, ready for the outward stroke, when, on arriving at the point of action, the induction steam passage corresponds with the passage of supply, which is directly over the axis. The pistons are then in succession driven from the centre of rotation to the end of the stroke, whilst the pistons to which they are coupled, are simultaneously raised to the centre, so that as the disc rotates, all the descending pistons on one side the vertical plane of the axis, are at the greatest distance therefrom, whilst all the pistons on the other side are drawn towards it, and it is this difference in the leverage or weight of the pistons, with regard to the central fulcrum or axis, which causes the disc to rotate.

[Printed, 6*d*. Drawing.]

A.D. 1865, March 11.—N° 685.

WILSON, EDWARD BROWN, and HOWDEN, JAMES.—(*Provisional protection only.*)—This invention relates to the construction of steam boilers and furnaces, to which, so far as the mode adopted for supplying the fuel, and the air necessary to support combustion, the invention is supplementary to two former Letters Patent granted to the first-named inventor, and dated respectively October 3, 1863, No. 2425, and February 16, 1865, No. 443, the fuel, as described in respect to such previous inventions, descending through a hopper placed at the outside end of the furnace, and the air necessary to support combustion passing down through the fuel from the top, no air being admitted through grate-bars or other passages.

According to the present invention, the furnace, consisting of a rectangular fire-box surrounded with water space which communicates with the water in the boiler, is attached to the front of the boiler. Fire-bars are not required, the bed of fuel resting upon a sloping solid plate, which may form the top of a chambered space in connection with the surrounding water space. The bed of fuel occupies the internal space of the furnace, which may, where the fiercest heat impinges, be lined with fire-brick, and a bridge may be constructed across the end of the fire-bed plate to prevent the body of incandescent fuel from sliding off, and yet be sufficiently low to admit of the spent fuel falling over into the closed ash chamber. The air is admitted through the hopper, in quantity regulated by a door or sliding cover. The hot draught is carried to the back of the boiler, and returns through the interior by means of a multitubular arrangement of fire-tubes.

Constructive details of the invention, considerably modified to suit different descriptions of boilers, are described.

[Printed, 4*d*. No Drawings.]

A.D. 1865, March 14.—N° 719.

NEWTON, Alfred Vincent.—(*A communication from Daniel Somes.*)—(*Provisional protection only.*)—This invention relates to securing low uniform temperatures for condensing, cooling, and refrigerating and other operations. For these and similar purposes, the low temperature which exists below the surface of the earth is availed of for cooling a current of water, which is forced or conducted to a proper depth by means of pipes or channels, and after being cooled, is caused to flow upwards to the surface into coils or other arrangements of pipes or into reservoirs, where passing through pipes contained therein, currents of air or steam are condensed or cooled, and afterwards carried off through suitable channels to effect the various uses to which the invention may be applied. Air for cooling apartments in buildings may be compressed whilst being cooled, and steam surface condensers are to be so constructed, that the stream of cold water from the subterranean coolers, shall circulate over the entire surface of the pipes, channels or vessels, variously arranged for the passage of the steam.

Amongst other uses the invention may be employed for changing and cooling the temperature of the air in ships, the fresh cold air being gathered from the surface of the water by the use of inverted bells or vessels, which are caused by the motions of the ship to dip into the water, and by the pressure thus brought to bear upon their atmospheric contents, the latter is forced through suitable valves and pipes into the ship.

[Printed, 4*d*. No Drawings.]

A.D. 1865, March 16.—N° 736.

RAMSBOTTOM, John.—This invention, relating to improved machinery for rolling and shaping metals, is supplementary to prior Letters Patent, granted to this inventor and dated April 13, 1863, No. 924. One part consists in adapting upon rails at the back of the segmental rolls described in the former Specification, a frame to receive the article under operation as it passes from between the rolls; by means of a weight suspended by a chain which passes over a pulley and is attached to the frame, the latter (excepting as it is pushed away by the article as it comes through) is kept close to the rolls, so that when their action is reversed the article may return and repass between them without any manual assistance.

Also "applying to the front of the rolls an open-ended cradle " or trough; this cradle is mounted upon circular ribs resting " upon antifriction rollers which are mounted on a truck or frame " moving laterally so as to traverse the ingot or other article " from one groove to another, the circular ribs allowing the cradle " to be partly turned round to present the ingot to the rolls in " the required position."

Also, by the direct application of hydraulic or steam power regulated by an hydraulic cylinder, imparting adjustable reciprocating motion to the axes of rolls carrying segmental surfaces, so as to admit of such rolls being rotated through any required range, and reversed at pleasure.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1865, March 16.—N° 743.

NEWTON, Alfred Vincent.—(*A communication from Eli Thayer and Sabin Peters Pond.*)—This invention, relating to steam generators and evaporators, is described as applied to a vertical steam boiler. The fire-grate surface is composed of a convoluted coil of metal tube, wherethrough, by communicating one end of the coil with the water space in the lower part of the boiler, and the other end with the water space in the upper part of the boiler, a free circulation of water through the coil is established.

The sides of the furnace or fire-box are inclosed by an annular water space formed by the shell of the boiler, and the flaming and other products of combustion, after playing over the internal surface of the fire-box, rise direct into a central chimney flue, which passes upwards through the steam space. An inverted cylinder, open at the lower end, divides the water space which surrounds the furnace, reaching nearly to the bottom, and separating from the body of the water which fills the annular water space, a thin sheet of water which envelopes the furnace and the base of the chimney flue. The effect of the heat from the furnace upon this thin sheet of water which surrounds it, causes an upward current and constant overflow from the top of the narrow space which surrounds the chimney. This overflow falls upon the top of the inverted cylinder, whereon all the sediment is deposited. The downflow takes place outside the cylinder, between it and the shell of the boiler.

A modification of the above internal arrangements is described.

[Printed, 6*d*. Drawing.]

A.D. 1865, March 17.—N° 748.

LAWRENCE, Benjamin.—(*A communication from Thomas Ewbank.*)—This invention relates to "increasing the mechanical "value of steam as a motive agent" when used in conjunction with a condenser. Instead of passing the used steam from the cylinder into a condenser, it is directed under a piston in a much larger cylinder, the top of which is open; the steam is condensed below the piston, which being acted upon by the weight of the atmosphere, a much greater amount of force is obtained therefrom, than by the ordinary mode of working and condensing low-pressure steam. "If the pressure of the steam be equal to 15 lbs. " per inch on the safety valve, it would on leaving the steam " cylinder expand and fill an atmospheric cylinder twice as large; " if 30 lbs., three times; if 45 lbs., four times." "The area of " the atmospheric piston increases with the pressure, while that " of the steam piston remains the same under all pressures . . . . " the contracting force keeps up with the expanding force, and " just as much" power "is obtained from the condensation of " the steam, as from its direct pressure."

[Printed, 8*d*. Drawing.]

A.D. 1865, March 17.—N° 751. (* *)

GOODFELLOW, JACOB.—(*Provisional protection only.*)—" Improved combinations of direct-acting steam engines with single " or double-acting pumps for pumping water, air, or gases."

" In one arrangement I bolt at one end of a foundation or bed-" plate the cylinder of the steam engine, and at the other end the " cylinder or barrel of the pump, and connect the two cylinders " together by a strong stay or frame of cast or wrought iron, for " the purpose of maintaining the two cylinders parallel with each " other, . . and the piston of the engine and the bucket or " plunger of the pump are connected together by one piston rod " in one piece, or two pieces coupled together, and therefore the " piston works the pump direct. For working the cock or valve " for opening and shutting the steam ports . . I employ a " tumbler lever working in connection with a second lever jointed " to a rod connected at its other end by an arm or bracket to the " piston rod, so that as the arm moves to and fro with the piston " rod it gives vibrating motion to the aforesaid second lever for " enabling it to act by means of adjustable studs upon the " tumbler lever, and cause it to fall first on one side and then on " the other, for giving alternate to-and-fro motions to the cock or " valve; or instead of employing a second lever the tumbler lever " can be worked direct by the rod and bracket from the piston " rod."

[Printed, 4*d*. No Drawings.]

A.D. 1865, March 20.—N° 771.

ROMMINGER, JOHANN TOBIAS.—(*A communication from Peter Corfitz Möller*).—This invention relates to steam generators, the peculiarity of which consists in the form and combination of a series of pipes, whereby it is stated "the greatest possible heating "surface combined with the smallest possible steam generating "surface" is obtained. The pipes or channels are of cast iron, with in some cases wrought-iron tubular linings; externally in transverse section they are in the form of a rectangular cross, the tubulated part being directly in the centre, where the lines of the arms intersect. When a number of these pipes are placed in series side by side, so that the horizontal right and left arms meet, and other series are placed above and below, so that the vertical arms meet, a number of flues or rectangular passages are formed, through which the hot draughts and flaming gases take their course; and by suitable arrangements at each end, the feed water, which is forced into the first pipe, is made to course through each pipe of the series in succession to-and-fro to the last. Metal rods are introduced into the pipes to prevent the subsidence of sediment which, by reducing the internal area, insures a more rapid water flow. A hand pump is used when starting the engine. The upper part of the apparatus comprises a smoke box and a steam chamber, furnished with a safety valve, which, when acted upon by superabundant steam, so acts upon a governor, that a portion of the feed water is allowed to pass without entering the boiler or generator.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 20.—N° 780.

MACKENZIE, Alexander Richard.—This invention relates to arrangements of steam or other engines, for driving omnibuses, carriages, traction and fire engines, and agricultural machines. When the invention is applied to an omnibus, and steam is employed, one or more boilers are fixed to the framework of the vehicle, and one or more fixed or oscillating cylinders are suitably disposed on the fore part, for giving motion to a cross shaft divided into three parts, and provided with two clutch boxes. This shaft, which is properly supported, carries two chain wheels, whence by means of endless chains and a corresponding chain wheel attached to the nave of each of the two driving wheels, the latter are set in motion on the ends of a fixed axle, transversely disposed under the carriage body. The driver on the fore part of the vehicle, operates the clutches by means of side levers, and steers the carriage by apparatus which changes the direction of the fore axle and wheels in the ordinary way.

Instead of using an ordinary vertical chimney, the products of combustion from the boiler fires are caused to pass through down flues, the open ends of which below the framework are covered by wire gauze or perforated plates, and the fire draught is regulated by a movable ash-pan. The exhaust steam is received in suitable chambers and condensed, and the resultant water pumped back again into the boiler. When applied to omnibuses the condensing chambers are also made to serve for warming purposes. The breaks in connection with the steam valve, are worked by treadles operated by the feet of the driver. The arrangements are modified when compressed air is the motive power.

[Printed, 10d. Drawing.]

A.D. 1865, March 23.—Nº 827.

BOULTON, Matthew Piers Watt.—This invention, which relates to "obtaining motive power from aeriform fluids and from "liquids" has for its object the utilization of heat evolved by combustion, for producing motive power through a greater than the ordinary range of temperature and pressure, in order that a larger proportion of the heat may be converted into mechanical effect.

Valves used for regulating the passage of highly heated aeriform fluids, work in valve chambers containing liquid, the level of which when caused to rise closes the fluid way, and which orifice is opened when the level of the liquid falls. This effect is produced by means of a plunger which is actuated by the engine. Two valves may be employed, one exposed to the greatest heat partially closing, and the other protected by the first entirely closing the passage. The valve may be constructed with internal passages, through which a current of cold water may be caused to flow for the purpose of keeping the valve cool.

When products of combustion are employed to work a piston, the induction valves shut off the supplies of inflammable fluid and air previous to their combination, ignition being caused
flame burning in the passage or orifice, or by means
e spark.

treams or falls of water or liquid, set in motion by
pressure aeriform fluid, are employed to produce

motive power. Two vessels of unequal height are united by a passage for the free interflow of liquid. Aeriform fluid under pressure is blown into the liquid in the highest vessel, which is thereby caused to overflow, the liquid falling into the lower vessel, and this constant fall is availed of for giving motion to a wheel, turbine, or engine.

Artificial streams may be set in motion by the impulsive force of jets of high-pressure aeriform fluid, and caused to act upon vanes attached to rods which work to-and-fro, and impart reciprocating motion to machinery.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 24.—N° 828.

SIMONS, William, and BROWN, Andrew.—This invention relates to steam dredging apparatus, arranged for working in steam vessels capable of visiting distant stations, under either steam or canvas.

It is proposed to form longitudinally in the vessel, a long central well or opening, but so as not to interfere with the run or lines of the head and stern, and yet be of sufficient length to admit of lowering through to the required depth, the bucket frame or supporting ladder, and the endless chain of buckets, which are operated direct by a suitable steam engine and the necessary gear.

When required to move to a distant station, arrangements are provided for bringing the chain of dredging buckets and the supporting frame, into a sloping position above the line of the keel, so that when the vessel is under way, they may form little or no obstruction to the speed. In addition to the dredging machinery and apparatus the vessel is fitted with one or more screw propellers, driven either by a separate engine, or by those which, when in gear therewith, work the dredging apparatus. It is intended that the vessel shall be full rigged as a screw steamer, the lower masts being constructed in combination with the fixed shear legs, whereby the lifting of the fore and after ends of the bucket frame and chain of buckets is effected. During the operation of dredging, it will prove an advantage to be able to move the vessel slowly forward by means of the screw.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 25.—N° 854.

BLACKE, David Estler.—(*Provisional protection only.*)—This invention relates to utilizing the heat of steam emitted from an engine. The apparatus employed "consists of a vessel in the "form of a cylinder or otherwise, to suit the form and position "of the engine to which it is to be attached, into which I intro"duce tubes of any requisite size and number, making them "fast in the ends of the vessel in such a way that the interior "of the vessel will be steam-tight, the tubes being open at the "ends for the purpose of allowing the steam and water that are "blown into them to pass through. The said vessel I supply "with water from the boiler or boilers to which the engine is "attached, and, if necessary, from the source whence the feed "water is obtained, but either of these sources of supply may be "used separately. To the said tubular vessel I attach a pipe "leading to the boiler or to the engine, for the purpose of "allowing steam free ingress or egress. I place the said tubular "vessel in such a position with respect to the engine, that the "steam, after passing through the engine will, before it is allowed "to entirely escape, pass into the tubes, my object being to com"municate to the contents of the tubular vessel aforesaid the "heat of the steam, which otherwise might be blown into the "atmosphere or condensed by water, and by this means to effect "a saving in fuel, the steam being used over again for the "purpose of heating."

[Printed, 4*d.* No Drawings.]

A.D. 1865, March 27.—N° 860.

ROOKE, Joshua.—This invention relates to compound high and low pressure steam engines, and to the slide valves of the high-pressure cylinder. The two cylinders are contained in one casting contiguous to each other, in order that the exhaust steam passage, from the small or high-pressure cylinder, to the larger or expansion cylinder may be as short as possible. The cylinders

laced to act either vertically, horizontally, or at an angle,
njoint action by means of an intermediate beam lever
ks, is so arranged, that the pistons in relation to each
ys move in contrary directions. Either a trunk and
ton are employed in the low-pressure cylinder, or a
rod of the ordinary description. The "valve is a

" many-ported slide valve;" a certain number of the ports admit and cut-off the steam from the boiler, and the remaining ports serve for the eduction from the high-pressure to the expansion cylinder, whence, after expansion, by means of an ordinary independent double-ported slide valve suitably timed, it is educted and passes to the condenser. The advantages said to be gained by these arrangements, are simplicity of construction, and a saving in the consumption of fuel, obtained by shortening and thereby reducing the cubic contents of the passages, and the unprofitable expansion of steam therein.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, March 27.—N° 862. (* *)

MATTHEWS, Charles, and FEREDAY, John.—(*Provisional protection only.*)—" Improvements in the construction of furnaces " for the consumption of smoke." "This invention consists in " constructing furnaces for steam boilers and for other purposes " with a bridge flue and a series of traversing flues partly open " and partly closed." "The first take-up flue is over the centre " of the bridge" passing to " the end of the furnace," whence it returns and " then passes transversely through the double bridge " and ascends the other side of the furnace into the stack." Under each of the open flues are the closed flues; " the top of " the hollow bridge is covered with open laid brickwork;" perforated dampers are placed in the open flues at the first and third bends; and the closed flues are provided with soot doors.

[Printed, 4*d.* No Drawings.]

A.D. 1865, March 27.—N° 864.

LE ROY, Ferdinand.—This invention relates to a non-heat-conducting composition, to be used for covering steam boilers, steam engines cylinders, steam pipes and other heated surfaces, so as to prevent therefrom the radiation of heat; it is also applicable as a coating for pumps, pipes, utensils, and other vessels containing liquids, for the purpose of forming a protection against external air, and intense cold or frost. The proportion of the several ingredients by weight consists of, 112 parts of slimy or brick clay, 28 parts of fire-clay, 28 parts of sand, 28 parts of coal ashes, 70 parts of wood charcoal, 28 parts of wood sawdust, 12 parts of cow hair, 2 parts of wheaten flour, 80 parts of water, and 36 parts of cotton foot oil, or other analogous fatty matter. The whole is to be well mixed and combined in a suitable vessel provided with a stirring apparatus, until it is brought to the consistency of plasterer's mortar, and the coating from ½ to 2 inches in thickness is laid on in the same manner, When dry, the substance formed is of a light, hard, and porous nature. The proportions of the ingredients, and the mode of mixing may be modified.

[Printed, *4d.* No Drawings.]

A.D. 1865, March 27.—N° 867.

WEST, William.—(*Provisional protection only.*)—This invention, which relates to the preparation of lubricating compounds, "consists in the employment of kaolin (china clay) or mica, or "mixtures of these substances, in combination with tallow or "other fatty or oily matters. Coal or other tar is also usually "employed with or without other ingredients according to the "effect desired to be obtained. The proportion of the china clay "or mica, or the mixtures thereof, may be greatly varied, but as "a general rule such substance or substances is or are to form "the base or principal ingredient of the lubricating compound. "The materials are mixed intimately together, applying heat "when necessary in making the compound. The fatty and oily "matters may in some cases be saponified, or have combined "therewith alkalies or alkine earths or oxides; other ingredients "may be added to the mixture; but it is believed that compounds "consisting of kaolin or mica, or mixture thereof combined with "tar and tallow, or other fatty or oily matters are best suited for "general purposes," (viz.) 112 lbs. of kaolin, or of mica, or a mixture thereof, 6 gallons of coal or other tar, and 10 lbs. of tallow. The ingredients mixed according to the above proportions, it is stated, form a suitable lubricating compound for the bearings and parts of steam and other machinery.

[Printed, *4d.* No Drawings.]

A.D. 1865, March 28.—N° 882.

WRIGHT, Joseph.—This invention relates to steam forging machines, wherein are employed four hammers arranged at right angles, two vertically and two horizontally on the same plane, to alternately upon a central object or forging in converging and rging pairs. The hammers are fitted to slide in radial grooves formed at right angles on the face of the framing, and are operated alternately in pairs, so as to strike simultaneously on the opposite sides of the metal, no anvil block being required. The hammers are connected by four levers, one hammer being attached to the piston rod, is moved direct by the engine, which is placed in a vertical line beneath. When this hammer is raised by the piston to strike the under side of the forging, the pair of hammers on the horizontal plane are by the action of the levers forced apart, and the hammer in the vertical line above is brought down simultaneously and strikes at the same moment upon the upper side of the forging. The down stroke of the piston causes the pair of vertical hammers to diverge, and by means of the connecting levers the horizontal pair are brought to bear upon the forging, acting upon it simultaneously at opposite sides. In this way the pairs act by turns, each one of a pair resisting the impulse of the other.

The arrangements may be modified by causing the hammers to strike at an angle, or by causing all to strike simultaneously, and more than one steam cylinder and piston may be employed.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 31.—N° 906.

SWARBRICK, John, SWARBRICK, David, SWARBRICK, Benjamin, and SWARBRICK, Ormerod.—This invention relates to steam boilers. The inventors say “Instead of placing fire-bars in the flue or flues for supporting the fire, we employ a hollow fire-box having in it any convenient number of vertical tubes open at the top to the fire and at the bottom to the ash hole, the said tubes being round, rectangular, or of any other suitable shape. To the said fire-box and boiler we connect pipes through which the water will pass into the fire-box and circulate therein, so that the heated surface of the fire-box and exteriors of the vertical tubes shall give additional heat to the water, and at the same time keep the box at a lower temperature than the ordinary fire-bars, and thereby prevent the clinkers from sticking. We also place one or more moveable metal heat spreaders behind the bridge, and in the back part of the flue or flues, in order to cause the heat and flame to radiate and impinge upon the inner circumference of the flue or flues; and in order to enable the heat spreaders to cause as little obstruc-

" tion as possible we make their surfaces facing the fire of a " spherical or circular shape." The feed water is introduced at the bottom of the boiler or at the front of the fire-box, in order that it may enter the boiler in a heated state. The heat spreaders are supported on legs, and are shaped to correspond with the form of the flues. The invention is applicable to marine boilers, as well as to boilers which are fired underneath.

[Printed, 10*d*. Drawing.]

A.D. 1865, April 3.—N° 935.

GOLLINGS, William Cantrill.—(*Provisional protection only.*)—The object of this invention, which it is stated can be used in the construction of a rotary steam engine or pump, is described as applied to paddle wheels for the purpose of gaining speed, by maintaining during revolution each paddle or float in a perpendicular position by means of additional wheels, one on each side of the vessel revolving upon a fixed axis, fastened above the paddle wheel shaft to the outer beam of each paddle box. The boards or floats of each paddle wheel, are thereby severally kept perpendicular at all points of the revolution by means of a crank arm on each float, attached to and guided by the additional wheels.

"The same system of keeping paddles or floats perpendicular " can be used for the purpose of constructing a rotary steam or " water engine or pump."

[Printed, 8*d*. Drawing.]

A.D. 1865, April 4.—N° 949.

BROOKES, William.—(*A communication from Joseph Perrigault, Marie Joseph Denis Farcot, Jean Joseph Leon Farcot, Michel Basile Abel Farcot, Joseph Etienne Eloi Château, and Emmanuel Denis Farcot.*)—This invention relating to apparatus for obtaining motive power, consists " in a new mode of employing steam, gas, " and other fluids to act upon revolving wheels. For this pur- " pose the wheel is arranged in such manner that it receives a " a series of successive different and decreasing impulses of the " same fluid without the progress of the fluid being stopped or " hindered in its passage. The impulses may be successive and intermittent or successive and continuous according to the arrangement of the wheel without the principle of the Invention

" being modified, because it consists specially in obtaining a " repetition of the action of the same fluid, which thereby " successively gives up a part of its velocity."

"In order to produce intermittent impulses the floats or vanes " of the wheel are of form variable enclosed between two parts of " the same fixed case. The fluid being introduced with a certain " velocity comes in contact with one of the floats of the wheel " giving to it a part of its velocity, and then escapes by a lateral " orifice which conducts it upon another float to which it gives " likewise a part of its velocity. The fluid acts thus successively " upon the different floats or vanes of the wheel, losing each time " a fraction of its velocity approximating to that of the wheel, " and it will at the end of the motion have given off its power " almost entirely without requiring great velocity of rotation as in " wheels as ordinarily arranged."

"In order to transform a wheel with successive and intermittent impulses into a wheel with successive and continuous " impulses, it suffices to prolong sufficiently one of the floats; " this may be realized by giving to the wheel the form of a spiral " curve or involute of a circle departing progressively from its " axis. Wheels of this system may be worked by steam with or " without condensation, and the apparatus may be surrounded " by a case heated to prevent cooling."

Modified constructive arrangements of the apparatus are described and illustrated.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1865, April 4.—N° 953.

VAUGHAN, Joseph.—This invention consists "in causing the " pistons of steam and atmospheric hammers and presses as they " approach near the end of their upward stroke, or at any " required point of their stroke, to close the exhaust passage, and " thereby prevent any escape of air or steam from above the " piston after it has arrived at the position described. The momentum of the rising piston and parts moved therewith " continues the motion of the piston after the exhaust has been " shut off; the air or steam between the piston and top of the " cylinder is thereby compressed and forms as it were an air " cushion, which prevents the piston striking the top of the " cylinder, and which as the piston commences its return or

" descending stroke starts the piston by its elasticity, and thus " aids the air or steam in impelling the piston downwards." " At the bottom of the exhaust passage is a valve kept open by a " coiled or other spring, and on the other side of the valve " a stronger spring is fixed. The first-named spring keeps the " valve open until the piston in rising comes in contact with the " lower and stronger spring, and by compressing it causes it to " close the exhaust passage. Or the valve by which the exhaust " passage is closed may be carried by the piston of the hammer " or press."

The invention "may also be applied to steam engines, the " shutting off of the exhaust being effected both at the top and " bottom of the cylinder. In this case the piston starts at the " commencement of each stroke with greater force than in ordi- " nary steam engines, so that immediately the crank has passed " the dead point the crank rod is made to act upon the crank " with much more than the usual force."

[Printed, 10*d*. Drawing.]

A.D. 1865, April 5.—N° 962.

ALLEYNE, John Gay Newton.—This invention relates to two mechanical arrangements for imparting motion to the driving wheels of traction engines. First, by means of a worm and worm wheel; for which purpose two steam cylinders are arranged " one " on each side of the smoke box, to act upon either one and the " same crank or two separate cranks of a crank shaft situated " in the longitudinal centre line of the engine. This crank shaft " is connected by means of universal joints or other suitable " coupling, and an intermediate shaft to the worm in gear with " the worm wheel fixed on the axles of the driving wheels, to the " axle boxes of which the framing carrying the worm is attached. " The worm is made of such a pitch as just to be capable of " being made to revolve by the worm-wheel, so that the engine " is not made to stop dead when the steam is shut off. If, in the " above described arrangement, both steam cylinders are made " to work upon one and the same crank at right angles to each " other, the slide valves to both cylinders can be worked by " one and the same cam or excentric upon the crank shaft."

The second imparts locomotion " to traction engines by means " of an endless band or chain passing round a pulley or chain

" wheel on the crank shaft of the steam engine, and round a " pulley or chain wheel on the driving wheels, arranged in such a " manner that either a fast or a slow motion may be imparted to " the driving wheels."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, April 6.—N° 981.

JOHNSON, John Henry.—(*A communication from Herman Haupt.*)—This invention relates to apparatus combined with and actuated by steam or other motive power, for drilling or boring rocks and mineral substances, tunnelling, mining, and similar operations; it also serves in part to ventilate the workings of mines.

The steam cylinder has side trunnions, which support the apparatus on bearings in a suitable frame, whereon it is mounted and balanced, so as to admit of adjustment for operating in any required direction. The usual valve chamber is cast on the top of the cylinder, and suitably arranged pipes are connected for the induction and emission of the steam. The cylinder is provided with a piston, fixed on a hollow piston rod, the ends of which respectively pass out through the cylinder covers. The steam admission into, and the exhaust from the cylinder, is regulated by the action of the drill. The drill or drill-holder is held to the hollow piston rod by a "gripper box," which relaxes at the end of the outward stroke, and allows the drill to adjust itself against the face of the rock or working, and which also each back stroke, by means of an internal ratchet and pawl or otherwise, gives slow intermittent rotary motion to the drill. It is found preferable to multiply the strokes of the tool on the rock under full head of steam, between each advance or feed of the drill.

The boiler is advanced along the working on a tramway, the smoke, exhaust steam, and vitiated air, being carried off by a pipe, the contents of which are drawn out or exhausted by a fan.

[Printed, 1*s*. Drawing.]

A.D. 1865, April 6.—N° 982.

JONES, James Grafton.—This invention relates to apparatus for actuating the valves of steam and other engines, applicable to engines employed for giving motion to the picks and tools used in getting coal and other minerals, and for the performance of work, where the length of each succeeding stroke of the engine, may vary by reason of interfering causes. The apparatus is described as applied to a horizontal-cylinder engine. "The piston rod is " hollow, and has within it a rod which at its outer end is con- " nected to one end of a lever, which at its other end is connected " to a slide valve. The rod which is received into the hollow " piston rod has fixed on it at one end a disc or piston which " fits but slides very freely in the hollow piston rod. The other " end of the rod which slides within the piston rod passes " through a stuffing box in the cover at one end of the cylinder " of the engine; and such sliding rod has a collar on it where it " comes against the piston, so that when the piston of the engine " is moving back after it has performed a stroke it forces the " sliding rod back, and consequently reverses the valve, but " when the piston is making the next stroke, should the piston " be prevented making a complete stroke from end to end of the " cylinder, then the tappet or instrument" (preferred to be a cylinder of lead lined or bushed with brass) "will by its mo- " mentum continue its motion, and it will slide along the rod " within the hollow piston rod, and will strike against the disc, " and cause it and the rod to which it is fixed to slide within the " piston rod, and thus move or reverse the valve."

[Printed, 8*d*. Drawing.]

A.D. 1865, April 7.—N° 988.

RYDILL, GEORGE.—(*Provisional protection only.*)—This invention relates to the construction of steam boilers, their flues and furnaces. Two or more ordinary boilers are placed in any parallel position a short distance apart, and are made to communicate with each other by means of multitubular arrangements of curved tubes, which are capable of supporting one boiler when superposed above another. The flue sides are of iron, framed and so constructed as to be capable of removal either laterally or endways on rails, for the purpose of gaining access to the flues. Water pipes are fitted inside these flue frames, and made to communicate with the water in the boilers, which freely circulates through them. The frames are filled in with brick-work, and come close up to the sides of the boilers, thereby forming upper and under flues. The boilers are secured to each other by suitable stays, they are made in short lengths, and may be disposed side by side in series, with furnaces at intervals and at one end, all discharging into one flue. An air culvert is constructed for conducting air to the furnaces.

[Printed, 4d. No Drawings.]

A.D. 1865, April 7.—N° 991.

SMITH, SAMUEL, and JACKSON, JOHN WILLIAM.—This invention relates to governors for steam and other motive power engines; its novelty consists in causing, at one fixed speed of the governor, the centripetal to balance the centrifugal force of the weights by means of a parabolic curvilinear movement of the governor balls, which is effected by the use of a paraboliformed slide or bearing for the balls, secured to the vertical spindle and more quickly curving upwards than the arc commonly described by the balls of the ordinary governor. The supporting arms are connected to the balls by a sliding joint or slot, so that at a given speed, whatever be the distance of the balls from the spindle, the gravitation of the balls balances their centrifugal impulse; but if the speed be either accelerated or moderated, then by means of the ordinary connecting rods and levers, the throttle valve is more or less correspondingly acted upon, until the normal speed is re-established and the balance restored. It is stated that the mechanical arrangement for generating the curvilinear movement of the balls may be varied.

[Printed, 10d. Drawing.]

A.D. 1865, April 8.—N° 1002.

GEDGE, WILLIAM EDWARD. — (*A communication from Alfred Taillendeau.*) — This invention relates to a novel application of steam power to the locomotion of trains of carriages on common roads. Each wagon or vehicle is propelled by its own wheels, and only receives traction for the purpose of changing its direction. " Motion is communicated from one vehicle to the other by " means of transmitting gearing fitted on the centre of the " coupling joint of the several vehicles. This centre of articula- " tion or point of attachment being the only one which does not

" change position in the different manœuvres of the train, is the " only one capable of carrying a mechanical movement from one " vehicle to the other." The steam engine gives motion to the driving wheels of its own carriage only by means of gearing. The crank shaft which carries the pinion is also " provided with a " pulley, which by means of a band transmits the motion to a " double pulley fixed on a vertical shaft fitted in the centre of " the joint, coupling the first vehicle with the following one." Each coupling joint between the succeeding carriages is fitted in the same way, and gives motion by means of bands and pulleys, to the wheel axles and wheels of the wagons or vehicles which follow. Instead of bands and pulleys, bevel gearing at the coupling centre may be employed for transmitting the motion from carriage to carriage through the train. Ordinary breaks are provided, and the carriage of the engine and boiler is fitted with a fore carriage and steering apparatus, and may carry a windlass in case of need.

[Printed, 6*d*. Drawing.]

A.D. 1865, April 11.—N° 1029.

JOHNSON, JOHN HENRY. — (*A communication from Thomas Luders.*)—(*Letters Patent void for want of Final Specification.*)— " This invention relates to a peculiar mode of constructing steam " generators, which is also applicable to the constructing of " condensers or coolers, and consists in the employment of a " number of hollow slabs or chambers of cast iron, each slab or " chamber being composed of any desired number of hollow " spheres cast together with curved necks so as to establish a " free communication between all the spheres in each hollow slab " or chamber. A number of these hollow slabs or chambers are " disposed side by side in any desired form or arrangement according to the desired contour or form of the generator or " condenser to be erected, and they communicate with each other " by cross connections made at one or more of the corners of each " slab. . . . These cross connections are made by forming " spherical joints on the slabs . . . . and interposing a correspondingly shaped joint ring between each of the adjoining " chambers," the parts being drawn together by long screw bolts, which are tightened up outside the two end chambers of the *series. The steam* and water feed connections are conveniently attached to one or more of the intermediate joint rings. For steam boilers it is preferred that the slabs be placed at an angle of 45°.

[Printed, 4d. No Drawings.]

A.D. 1865, April 12.—N° 1051. (* *)

NEWTON, ALFRED VINCENT.—(*A communication from William Sellers.*)—" An improved construction of Giffard injector."

This invention relates to an improvement whereby Giffard's injector is rendered self-regulating. It consists in "using the " overflow water to control the admission of the water or steam " or both to the injector, so that the pressure inside the chamber, " caused by an overflowing jet, shall diminish the supply of water " or increase the supply of steam, or it may effect both, whilst " the water which has escaped at the point of overflow to produce this effect, being retained in contact with the jet will be " drawn in again whenever the supply of water is too small or " the supply of steam too great, and thus produce a partial " vacuum in the overflow chamber, reverse the previous operation, " and re-adjust the instrument to the new conditions without " any waste at the point of overflow."

[Printed, 10d. Drawing.]

A.D. 1865, April 13.—N° 1059.

DAWSON, SETH, BURGESS, JOHN, and WILSON, JOHN.—(*Provisional protection only.*)—This invention, relating to a mode of effecting an even expansion in the packing rings of the metallic pistons of steam and other engines, consists in the use of a helical " or other spring, acting with a downward pressure, so " that when compressed by the cover of the piston and its screws, " they act upon and impart a lateral pressure to the ordinary V " ring employed to expand the packing rings, which pressure " may be received by an extra ring encircling the piston block, " and be thereby transferred to the ordinary V ring to press the " same outwards to keep the packing rings in contact with the " interior surface of the cylinder. When one spring is employed " it encircles the piston block, and is forced down by the screws " acting on the cover of the piston, and presses upon the aforesaid " extra ring, the inner surface of which fits and slides upon " the *piston block, its exterior* surface being inclined or wedge-

" shaped, and acts against the inner surface of the ordinary V
" ring and presses it outwards. The chief feature or object of
" the invention being to impart a lateral or outward expansion to
" the packing rings of the piston by the employment of an
" internal vertical pressure derived from its spring or springs."

[Printed, 4*d.* No Drawings.]

A.D. 1865, April 13.—N° 1062.

BROOMAN, Richard Archibald.—(*A communication from Pierre Samain.*)—This invention relates to apparatus for feeding boilers; it is also applied to the propulsion of vessels, and for discharging bilge water from the hold of a ship. The apparatus is composed of a cylindrical closed vessel or receiver, placed contiguous to the boiler in communication with the steam and water spaces, by pipes attached respectively to the top and bottom of the vessel. "A syphon tube leads from the top of the receiver to
" a condenser above. There is a float in the receiver fitted with
" an elastic ball at top and bottom, which balls act as valves, the
" upper one to close the end of the syphon tube, and the lower
" to close the pipe which leads from the bottom of the receiver.
" There is also another float in this last-named pipe. If the
" receiver be filled with water the float therein is raised to the
" top, so that the upper valve is closed and the lower valve open.
" Steam from the boiler led by the pipe communicating with the
" first of the orifices before-mentioned, enters the upper part of
" the receiver and exerts pressure on the surface of the water,
" compelling a portion of it to pass through the lower orifice to
" the boiler. The float in the receiver is thereby lowered and
" the upper valve opened, so as to allow the steam to pass up the
" syphon tube into the condenser. The pressure of the steam
" on the surface of the water in the condenser opens a valve in a
" pipe leading therefrom to the lower part of the receiver, which
" is thus supplied with water, and the float rises to the top as in
" the first instance. The condensation of the steam in the con-
" denser produces a vacuum therein, which draws into the con-
" denser a fresh supply of water from a reservoir placed on the
" boiler or other convenient part. Thus the condenser, while
" supplying the receiver, is not emptied, as it is itself continually
" fed from the reservoir. If the water level in the boiler becomes
" *lowered,* the second-named float falls and allows water to

" flow from the receiver to the boiler." Modifications of the apparatus are described, comprising apparatus for raising water and feeding boilers. The propulsion of vessels is to be effected by similar apparatus, drawing and discharging water, and the discharging of water from the hold of a ship is to be accomplished by the same means.

[Printed, 1*s*. Drawings.]

A.D. 1865, April 13.—N° 1064. (* *)

BEARDMORE, William, the younger.—(*Provisional protection only.*)—" Improvements in the arrangement of furnaces used " for puddling and reheating iron, the generation of steam, and " other similar purposes." "The furnace consists of a hopper" " situated above the fire-bars," for holding the fresh fuel, which as it descends gets coked. "A blast of steam or air may be intro- " duced " to increase "the intensity of the incandescence."

[Printed, 4*d*. No Drawings.]

A.D. 1865, April 15.—N° 1066.

COURTAULD, John Minton.—This invention relates to a safety apparatus for steam boilers, which " consists in the employ- " ment of a copper or other suitable metal tube carried through " the upper part of the boiler, and descending below the proper " working water level therein, and in connecting to the upper " part of the tube, carried to a greater or lesser height from the " top of the boiler, a rod, which by the expansion of the tube " acts upon a safety valve when the water falls below the proper " level and allows steam to escape from the boiler." Instead of fixing the tube through the top of the boiler, it is sometimes dipped into a pipe, which projects at a suitable level from the boiler side. An alarm whistle is sounded by the escaping steam and a detector shows when the valve has been raised. The apparatus may be used to give alarm when there is excessive steam pressure, for which purpose, a weight on the valve lever should be regulated to lift a little before the excessive pressure raises the main safety valve.

[Printed, 10*d*. Drawing.]

A.D. 1865, April 17.—N° 1074.

DE ST. CÉRAN, Louis.—This " invention relates to an ammo- " niacal gas engine in which the same water is used again and

" again. For this purpose a boiler or heating vessel is con-
" nected with a refrigerating worm which communicates with
" two receivers, one of which is filling while the other is empty-
" ing; these receivers communicate with a cylinder which is
" furnished with a piston and communicates with a close vessel
" filled with cold water, the vessel also communicates with the
" boiler in such manner that the water after absorbing ammonia
" as herein-after described is forced or pumped back into the
" boiler. Water saturated with ammoniacal gas having been
" introduced into the boiler and heated gives off the gas, which
" passes into the worm where it is refrigerated, and it thence
" flows into one or other of the two receivers, in which it is
" liquefied; communication is then opened between the receiver
" and the cylinder, whereupon the liquid ammonia vaporizes
" (being freed from the pressure from the boiler), and it flows in
" a state of vapour into the cylinder and acts on the piston. After
" working in the cylinder it passes into the close vessel, where it
" dissolves in or becomes absorbed by the cold water, which
" being thus saturated with gas is pumped or forced back into
" the boiler, and the gas is again given off under the action of
" heat; thus the same water serves again and again, being cooled,
" saturated with gas, and then reheated until the gas is given
" off; the process is repeated without a fresh feed of water or gas
" (from without) being required."

[Printed, 8*d.* Drawing.]

A.D. 1865, April 18.—N° 1079.

BAKEWELL, FREDERICK COLLIER.—(*A communication from Henry Johnson.*)—This invention relates to cushions for engine cylinders, and " consists in seating within the cylinder of a steam
" engine or steam hammer, and at a short distance from the end
" or ends of the cylinder, a moveable steam-tight disc or false
" head, the cylinder being lengthened sufficiently to give room
" for the stroke of the working piston below the disc, the steam
" from the boiler being admitted into the space between the
" moveable disc and the fixed head of the cylinder, so as to press
" the disc or false head into its seat. An elastic cushion is thus
" formed by the pressure of the steam on the farther side of the
" moveable disc . . . . , so that in case the piston working
" *in the* cylinder should strike against the moveable disc

" . . . . , the steam in the space between it and the fixed " head of the cylinder yields to the blow, and the elastic pressure " of the steam prevents the moveable disc from being forced " against the fixed head of the cylinder."

[Printed, 6*d*. Drawing.]

A.D. 1865, April 20.—Nº 1095.

HOCKING, JOHN.—(*Provisional protection not allowed.*)—This invention of apparatus for the prevention of explosions in steam boilers, has reference to that class known as " Cornish " or " Lancashire " boilers, and " consists in the adaptation and application to the inner tube of such boilers of a valve fitted into a " short pipe or socket fixed in the crown or upper part of the " tube, such valve being opened by the collapsing of the tube, in " the upper part of which the seat of the valve is fixed. The " valve is connected to a rod which passes through a stuffing box " fixed over a hole in the outer shell of the boiler, on the top of " which stuffing box is fixed a cross head through which the " upper part of the rod is passed. This upper part of the rod " has a screw formed on it, and there are two nuts, one over and " the other under the cross head, which engage with the said " screw, and by means of which the rod may be adjusted and the " valve secured in its seat as required. It is preferred that the " valve should be hemispherical or conical in order to prevent " leakage, but its form may be varied. It is also preferred that " the valve should be composed of fusible metal. In some cases " it may be found desirable to apply more than one valve to the " crown of the tube."

[Printed, 4*d*. No Drawings.]

A.D. 1865, April 21.—Nº 1112.

HUGHES, EDWARD THOMAS.—(*A communication from Frederic Henry Brinkmann and Ernest Frederic Wackwitz, the younger.*) (*Provisional protection only.*)—This invention, relating to packing for steam cylinders, stuffing boxes, vessels containing water, or aeriform fluids, and similar purposes, is intended to replace hempen and such like packing requiring to be soaked in grease or oil. The new packing consists of laminated bands of paper, of circular or other necessary form. These bands are first soaked in boiling water until perfectly soft, in which state they are packed in the stuffing box, one laid upon another around the piston or other rod until the box is sufficiently full, so that the bands can be pressed together by the cap or cover. It is stated that neither oil nor grease is required, and that the new packing is much cheaper and more efficient and durable than other packing.

[Printed, *4d.* No Drawings.]

A.D. 1865, April 21.—N° 1123.

HALL, Collinson.—The first part of this invention relates to steam engines for working ploughs and other implements, and consists, when two engines are employed at opposite sides of a field, in fitting on the crank shaft of each a double clutch, or one clutch within another, their respective teeth being cut in opposite directions. When one engine is put into gear for drawing the opposite plough or implement, and the movement of the rope is communicated to one or other of the clutches on the other engine, a spring or other appliance gives notice to the attendant that the first engine has commenced to work, so that he may put his engine into gear to assist the first engine. The double clutch arrangement regulates the speed and power of the engines.

The second part consists in moving the engine forward at each travel of the ploughs, by means of a worm and worm wheel carried on the shaft of the small chain wheel.

Third, relates to the drums over which the drawing ropes pass, as described in the Specification of Letters Patent granted to this inventor and bearing date March 11th, 1862, No. 658. The object being to prevent the clogging of the links of the chain on the tongues of the drums.

Fourth, relates to the ploughs, and consists in the employment of a rack on a horizontal longitudinal bar instead of the sectors, is described by this inventor in the Specification of other Letters Patent bearing date May 30th, 1864, No. 1338.

The last part consists in attaching to the frames of scarrifiers and other implements, blocks with circular or other shaped holes in front, wherein are fitted the heads of the prongs, tines, and other tilling tools.

[Printed, 2s. 2d. Drawings.]

A.D. 1865, April 22.—N° 1133.

NEWTON, Alfred Vincent.—(*A communication from William Judson.*)—(*Provisional protection only.*)—This invention relates to fitting the tubes in surface condensers, so as to allow of their expansion and contraction without injury to the tube sheets. " For the purpose of packing the ends of the tubes securely, " there are made around the holes in the tube sheets, for the " reception of the tubes, concentric annular grooves or recesses " either on the outer face or between the outer and inner faces " of the tube sheets to receive rings, tubes, or cups of elastic " material or vulcanized india-rubber. The tubes are intended " to be slipped over the ends of the inserted metal tubes, and " form an elastic packing for them by being severally confined " between the annular groove and a compressing cap applied " thereto. The annular grooves made in the face of the tube " sheets are by preference countersunk, and their bottoms are " coned to prevent the lower portion of the rubber tube from " hugging the metal tubes which they surround, too closely. Over " the ends of the tubular packing, metallic caps, suitably formed " to confine their outer ends, are slipped over the elastic tubes, " and forced into close contact therewith by means of nuts " screwed on to the ends of the tubes." Within the thickness of the tube sheet there may be two or more annular recesses, which must be filled with packing before the tubes are inserted. The fastening of the tubes to the tube sheets may be effected in various ways, one end being left free to allow for contraction.

An advancing cutter is employed for producing a countersunk groove or an annular recess in the holes of the tube sheet. This cutter is fitted into a slotted rod, which fits the holes in the sheet, the cutter being projected beyond the radius of the rod by means of a hand wheel, which screws down a thread cut on the rod to receive it.

The corroding action of feed water supplied from condensers is prevented by passing the water over granulated or scrap iron immediately before it enters the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1865, April 22.—N° 1134.

HOWARD, James, and BOUSFIELD, Edward Tenney.—(*Letters Patent void for want of final Specification.*)—The first part of this invention, which relates to steam cultivation, consists of an arrangement of mechanism for driving and coiling the hauling rope evenly upon the winding drum without the use of traversing guide pulleys, which, according to the present invention, are mounted on a stationary frame, and the drum, fixed upon a sliding sleeve, moves longitudinally upon the shaft which carries it.

The second part relates to a clutch for throwing in and out of action the gearing used in traction engines, which consists, according to one modification, in the use of sliding bolts connected with the driving shaft. The bolts which revolve with the shaft are operated by a hand lever, whereby, when required to set the gear wheel in motion, they are projected so as to engage against clutch teeth cast on the wheel, and withdrawn when the action of the gearing is required to cease.

[Printed, 4*d.* No Drawings.]

A.D. 1865, April 25.—N° 1152.

BROOMAN, Richard Archibald.—(*A communication from Etienne Sauret and Eugene de Fleury.*)—(*Provisional protection only.*)—This invention relates to smoke consuming furnaces, which effect the object sought, by means of supplementary fire-places formed in the masonry on each side of the furnace, and in which the combustion is effected by introducing air, which is forced in by a fan.

The invention is described as applied to a furnace for heating a boiler with two boiling vessels. "On each side of the ordinary "fire-bars, I form in the masonry an air chamber or longitudinal "arch of fire-brick or refractory material; below each air chamber "I construct another chamber, which is supplied with fuel, and "constitutes a supplementary fire-place. From the lower part of "each supplementary fire-place a pipe leads to another pipe com-"mon to both fire-places, and through which a current of air is "propelled by a fan or otherwise. The ordinary fire-place com-"municates with the supplementary fire-places by a series of "transverse passages, through which the flame from the supple-"mentary fire-places passes to lick the boiler. A pipe supplies "air to the air chambers, and passages lead this air from the air "chambers into the upper part of the supplementary fire-places. "The pipes which lead from the lower part of the fire-places can "be removed when required to clear out cinders or otherwise.

"Each of the supplementary fire-places is formed of two different "depths, the portion at the front being deeper than that at the "back, and the amount of fuel employed depends upon the position of the bridge between the two portions." Fuel is supplied to the supplementary fires through doors in the front of the furnace.

[Printed, 4*d*. No Drawings.]

A.D. 1865, April 27.—N° 1180.

FRANCIS, Anthony. — (*Provisional protection only.*) — This invention relates to apparatus for surface condensing, and to feeding steam boilers with the water produced thereby. A section of the apparatus consists of a vertical cylindrical case, containing concentrically, an inner case, wherein, in circumposition, there is a double set of vertical condensing tubes, which communicate with a small circular chamber near the bottom of the case. The condensing water enters by a central pipe at the top, and passes down the central tubes into the circular chamber, thence rising up the surrounding tubes to the top, flows over into the outer casing, whence it is discharged near the bottom by a suitable outlet pipe. The upper part of the casing is fitted with an air pipe which communicates with the atmosphere. The water of condensation is drawn from the bottom of the inner case. Three of these cylindrical condensers are so disposed in a line that the steam pipes, cold water, and condense water pipes communicate respectively by suitable branches with each section. The condense water is drawn from the apparatus by a double system of pumps and forced into the boiler. Cold air, in conjunction with the cold water or otherwise, is forced through the condensing tubes by means of a fan.

[Printed, 8*d*. Drawing.]

A.D. 1865, April 29.—N° 1195.

WYLLIE, Andrew, and GRAY, John McFarlane.—This invention relates to steam engines. 1st. To the valve motion of oscillating cylinders, and consists in adapting the traverse link as a reversing gear in combined engines, and also for variable expansion. The traverse link is so constructed that it can be thrown into inclining positions, and yet retain sufficient vertical motion to uncover the steam ports and give the required lead to the valve. When the link is inclined, say to the right, the engine goes ahead;

when to the left, the motion is reversed; and when in horizontal position, the engine is at rest. 2nd. Relates to working a separate expansion valve. The end of an excentric rod is jointed to one end of the link, the other end of which is attached to a lever by which it is supported and shifted, the curve of the link being modified to compensate for the curvilinear motions of the lever end. 3rd. Relates to a mode of reversing when the valves are worked from a counter-shaft, which is connected with the crank shaft by toothed gearing. This is effected by shifting one intermediate wheel perpendicularly with a line between the centres of the two adjacent wheels; when the three centres are in a line the engine is stopped, and when shifted to the right or to the left, the motions are correspondingly reversed. The teeth of the wheels should be involute. 4th, relates to a steam engine governor. Proposes to introduce a self-acting steam valve to regulate the admission of steam; the opening of the valve to be dependent on the difference between the pressure in the boiler and the pressure at the valve. 5th, relates to a drain pipe, which is attached to the mid-length of horizontal cylinders; this pipe communicates either with a condenser or the atmosphere, and is provided with a regulating cock. 6th, relates to the application of drain pipes to cylinders otherwise than horizontally disposed.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1865, April 29.—N° 1203.

LEATHAM, William.—The first part of this invention relates to six improvements in mechanical apparatus for working or cutting grooves in coal or minerals in mines, quarries, and places, by means of picks or cutting instruments operated by a piston in a cylinder, and actuated by the force of compressed air, steam pressure, or otherwise. The 1st consists in the mode adopted for firmly holding the machine during the cutting operation, which holding is effected by means of anchors or other appliances, adapted to fit into the grooves previously cut. 2nd, relates to the construction of, and to the mode of fixing the pick upon the movable arm, the cutting point of which is so formed to fit on the arm, as to be easy of removal for sharpening or otherwise. 3rd, consists in applying an additional cylinder to the apparatus. so connected that one piston will make two strokes whilst the other makes one, or two effective sudden strokes of the pick to one of the main piston. 4th, relates to adjusting and regulating the working height of the apparatus by means of screws, levers, or otherwise. 5th, consists in forming ratchet teeth round the flange of one or more of the sustaining wheels, for the purpose, by means of pawls, of checking backward motion whilst the pick is operating, the periphery of the sustaining wheels being perforated to receive the ends of conical studs, correspondingly fixed into the rails, which are constructed of corrugated iron plates, and form a portable frame of convenient length, and the 6th, relates to so fitting a lever to the machine carriage, that one end of such lever forms a seat for the attendant, whilst the other end, which is furnished with spurs or prongs, is raised against the roof of the mine, and forms an additional holding stay or prop.

The second part of the invention relates to apparatus for compressing the air employed for actuating the coal-cutting apparatus. A sufficient number of pairs of air pumps are mounted on the top of a circular vessel, which is furnished with suitable inlet and outlet valves, and constitutes the compressed air receiver or reservoir. Three pairs of vertical action pumps are shown in the drawing hexangularly circumposed thereon. Fitted upon the plunger of each pump is a friction roller, which receives downward pressure by means of a series of concentric cam inclines depending from a circular plate, which is fitted horizontally to revolve concentrically over the vessel. The plungers of each pair of pumps are connected by levers, and act alternately in such manner that the pressure upon the plunger of one pump raises the plunger of the other, and vice versa. The steam engine power is applied to the plate by means of annular gearing fixed thereon and actuated by a pinion on the driving shaft. A diminishing valve in connection with a compressible vessel, is employed for regulating the flow and supply of the compressed air; it is also applicable for regulating the flow of steam and fluids.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1865, May 1.—N° 1212.

RANKIN, Daniel.—(*Provisional protection only.*)—This invention relates to an arrangement of the parts of marine steam engines, obtaining thereby more convenient accessibility, an

greater compactness. It comprises one or more oscillating cylinders, the pistons of which have each two piston rods, relatively disposed at right angles to the crank shaft. " A cross head is
" fixed on the two piston rods, and on the side next the cylinder
" this cross head is formed to receive bearing brasses and a cover
" for connecting it upon the crank pin. With this arrangement
" the cylinder can be placed so nearly to the crank shaft that
" the crank pin will have only the thickness of the bearing brass
" with its cover, and a slight clearance in addition between it
" and the cylinder cover, whilst the stuffing boxes for the piston
" rods can without inconvenience be made of the extra length well
" known to be desirable with oscillating cylinders."

[Printed, 4*d*. No Drawings.]

A.D. 1865, May 2.—N° 1226. (* *)

RUSSELL, THOMAS.—(*Provisional protection only.*)—" Improve-
" ments in valves for liquids, steam, and gases."

"At opposite sides of the valve chamber are parallel slots
" extending nearly from end to end of the said chamber. To the
" top of the valve a cross bar is fixed, the ends of the said cross
" bar passing through the said slots. Upon the valve chamber the
" hand wheel or collar works, the valve chamber passing through
" a hole in the central boss of the hand wheel or collar. The
" said hand wheel or collar is held in its place on the said chamber
" by two collars, one fixed on the top of the chamber and the
" other screwed on the lower end; . . . the central boss of the
" hand wheel or collar is ground so as to work tight between these
" two collars. In the opening in the boss of the hand wheel or
" collar a concave screw is cut, and on the ends of the cross bar
" which project through the slots in the valve chamber a convex
" screw is cut, which convex screw takes into the concave screw in
" the hand wheel or collar. By turning the hand wheel or collar
" in one or other direction, the action of the screw thread in its
" boss on the screw at the ends of the cross bar causes the said
" cross bar to rise or fall and to open or close the valve."

[Printed, 4*d*. No Drawings.]

A.D. 1865, May 2.—N° 1230.

SIEMENS, CHARLES WILLIAM.—This invention relating to governing apparatus for regulating the power and speed of *machinery in motion*, has for its object to accomplish the functions of the free conical pendulum by an equal chronometric, but a less delicate arrangement than is described in the Specification of a prior invention communicated by this inventor to Joseph Woods, who obtained the grant of the patent dated April 18, 1844, No. 10,151.

The apparatus "consists of a cup or shell, open at top and " bottom, rotating on its vertical axis, which, dipping into a bath " of liquid, imparts centrifugal motion to the portion of the " liquid inside the cup, causing the liquid so impelled to rise " until it is on the point of overflowing. The liquid is maintained in this condition without further expenditure of power, " so long as the speed or power of the machine or apparatus to " be regulated remains at the normal standard; so soon as this " is exceeded, and a consequent increased impulse is imparted to " the cup, the liquid overflows the upper edge of the rotating " cup, causing expenditure of power, which will prevent the " further acceleration of the cup, and this absorption of power " may be further increased by causing the liquid thrown out to " pass alternately against a series of fixed radial vanes, and vanes " rotating with the cup. The power employed to maintain the " cup in motion, and which may act independently of the machine or apparatus to be regulated . . . is so regulated that " it is rather more than sufficient to maintain the liquid at the " point of overflow. . . The cup will therefore continue to rotate " with such uniform velocity as is just sufficient to raise the " liquid . . . to the point of overflow. . . . The rotating cup " is entirely inclosed in the vessel containing the liquid (which " may be either mercury, glycerine, or oil, or even water) its " spindle passing through such vessel in order to be connected " with the driving weight, spring, or other source of motion, and " with the differential wheels by which the action upon the " engine or mechanism is obtained." Modified arrangements of mechanism necessary when adapting the invention to practical purposes, are described and illustrated, including its application for regulating the speed and power of steam engines and other motors.

[Printed, 1s. 6d. Drawings.]

A.D. 1865, May 3.—N° 1240.

JOHNSON, John Henry.—(*A communication from George Bailey Brayton.*)—*This invention* relates to steam generators and engines, to apparatus for feeding steam generators, and to an arrangement of the cut-off valves of steam engines. 1st. It is proposed to generate the steam in tubes, the lower ends of which are horizontally disposed in tubular casings or "transmitting "medea" side by side immediately over the fire-bed beneath a series of horizontal plates, the products of combustion passing up into the body of the furnace through the intermediate spaces: at the back of the furnace the tubes take an upward direction to the top, then bend over towards the front and take a downward course, crossing again to the back and recrossing to the front, where all the ends in the series open into a horizontal pipe in communication with the lower part of a separate closed vessel, which is the 2nd part of the invention. The upper space of this vessel constitutes the steam reservoir, and the lower the water supply, the working level of which is established in the vertical part of the tubes at the back of the furnace. The water of condensed steam and feed water is supplied to the vessel by a force pump. 3rd, relates to the employment of variable self-adjusting cut-off valves, operated by the governor; the ordinary slide valve is provided at the ends with ports which open downwards through the face of the valve; these ports are closed by small slides actuated by the governor—the main slide is operated internally by a rocking lever, which enters under the cylinder facing, into the exhaust port; a short arm on this lever, operates two short toggle levers, which centre at each side of the hollow of the valve; this part of the invention is shown as applied to oscillating cylinders.

[Printed, 1*s*. Drawings.]

A.D. 1865, May 4.—N° 1253.

WOOD, THOMAS.—(*Provisional protection only.*)—This invention relates to a mode of steam condensing, applicable to marine engines. It consists in condensing the steam by the injection of fresh water, which has been repeatedly cooled by refrigeration. The water withdrawn from the condenser by the air pump, is caused to pass from the hot well through refrigerating apparatus, and then, in a cool state is again injected into the condenser, passing thence to the hot well, is again refrigerated and re-injected. Thin metal plates are used in the construction of the refrigerating apparatus, and so arranged with spaces between them, that alternate tortuous thin passages are formed for the passage of the cold sea water, and the intermediate passages for the water to be cooled; the current of each being caused to flow in opposite directions. A centrifugal pump, worked by the engine, is used for forcing the sea water.

[Printed, 4*d*. No Drawings.]

A.D. 1865, May 5.—N° 1259. (* *)

LAMPORT, Charles.—(*Provisional protection only.*)—" Im-" provements in the construction of and mode of supplying fuel " to fire grates, stoves, and the furnaces of locomotive and other " steam boilers."

The fuel is supplied to the under side of the fire," being forced up by a piston " working in the segment of a cylinder and " attached " to an axle. " When the piston attains to the level of " the grate bottom," " and all the fuel has been forced up into the " fire, the annular cylinder " " is again filled with fuel until it " reaches the under side of the piston. The piston is then drawn " through the slot in the axle to the other side," " the fire above " being sustained by the fresh fuel, and is then again " " pressed " upon the fuel, which " " is forced up, under, and into the fire " when required." The fire-grate is circular, " open on all sides," the gases " being carried off by a descending flue, or upwards by " pipes " through an adjustable cowl.

"The same arrangement can also be applied to any common " open grate, or to a stove grate.

In locomotive and other steam boiiers there is used an inverted syphon pipe, one end of which is attached to the centre of the furnace underneath, the other end projecting in front before the common door to receive the fresh coals. When the supply pipe is filled, pressure is applied to the surface of the coals at the outer end by means of a screw or lever attached to a cover, which, aided by the weight of the fuel in the longer arm of the pipe, forces the coals into the middle and under side of the fire.

[Printed, 4*d*. No Drawings.]

A.D. 1865, May 6.—N° 1264.

NEWTON, William Edward. — (*A communication from Ebenezer Danford.*)—This invention relates to generating and employing steam in steam engines, the object being to apply the motive power, derived from the instantaneous generation of steam to the piston of a steam engine. The steam cylinders in which the pistons work, are mounted on spherical generating chambers; these chambers are each formed by two hollow semi-spherical flanged castings, one half bolted above, and the other half bolted below a metal plate, which forms the roof of a furnace, the circular parts of the plate included within the chambers being removed. A pair of vertical standards, secured to the plate between the chambers, support a vibrating beam, to the ends of which the upper ends of the respective connecting rods are jointed, and are coupled to the piston rods beneath. By means of a pump, a regulated quantity of water is alternately injected into each generating chamber, enough instantaneously to produce the requisite quantity of steam for the upstroke by turns in each cylinder. The exhaust ports are opened by the motions of the slide valve, and the momentum of a fly-wheel is availed of, to keep up a uniform speed. The injection pumps are disposed upon the plate between the cylinders, and worked from a lever fixed on the fulcrum pin of the beam.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, May 8.—N° 1270.

BUCHANAN, James.—This invention relates to "furnace fire-" grates," the bars of which are capable of motion.

1st. The fire-grate surface is composed of a series of very short lengths of fire-bars arranged in sets. The several sets are respectively ranged upon cross rods or bars, which pass through holes in the fire-bars, and rest on a series of bearings severally disposed along the sides of the furnace. A rocking motion is simultaneously communicated to the cross-bars and the several sets of fire-bars, by means of a hand lever and several links or a link rod, which connects the ends of the cross bars together.

2nd. Relates to an arrangement of fire-bars designed for small sized grates. The sets of small bars which form the fire-grate surface may be cast with or attached to the cross bearing bars, which are connected by links or otherwise and operated by a hand lever.

3rd. Is supplementary to a prior invention, for which Letters Patent, dated December 4, 1857, No. 3005, were granted to this inventor, and consists in connecting the several rows of furnace bars, described in the Specification of the said Patent, by a long rod and pins, instead of employing a number of links for the purpose, in order that, in the event of the derangement of any one or more sets of bars, the operations of the remaining sets may be continued by the mere removal of the pins which connect the disabled sets with the rod.

[Printed, 10*d*. Drawing.]

A.D. 1865, May 9.—N° 1282.

TWEDDELL, Ralph Hart.—This invention relates to apparatus for fixing the ends of boiler and other tubes, and for cutting the ends or other parts of such tubes. For fixing the tube ends, dies are employed collectively of a circular form, the configuration of their external surface being shaped in conformity with the desired form of the interior of the tube. These dies are formed in segmental parts, which are simultaneously caused to diverge radially by means of a corresponding number of inclining surfaces, formed on a tapering rod attached to the piston or ram of an hydraulic cylinder which is packed and arranged to act in either direction. "The cutting of the ends or other parts of such tubes is effected " by the application of cutting edges to the segments."

[Printed, 8*d*. Drawing.]

A.D. 1865, May 10.—N° 1291.

ADAMSON, Daniel.—This invention relates to machinery for drilling and rivetting boiler and other metal plates. It is supplemental to a prior invention for which Letters Patent bearing date June 20th, 1862, No. 1820, were granted to this inventor and Levi Leigh. According to the first part of the present invention, twelve or other suitable number of drills are employed. The drill headstocks are circumposed round a central column, the upper part of which, described in the above-named patent, is now dispensed with. The drills, which all point radially to the centre, are driven from pulleys fixed on a corresponding number of radiating shafts which are mounted on an upper framework, and driven simultaneously by central annular gearing, to which the inner ends of the shafts, which carry suitable pinions, are convergently directed. All the necessary mechanical details are described, including the mode of holding the plates and annular boiler sections, and the adjusting apparatus for raising, lowering, and revolving the prescribed distance for setting in the drills.

The second part, relating to rivetting, consists in the use of pairs of dies which are attached to slides, and by means of levers and cams, made to approach each other to force and shape the rivet, and retreat after the operation, one of the dies being rigidly forced, whilst the other, by means of a heavily weighted lever, will yield in case of need, means being provided for throwing off the action when necessary.

A modification is described.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1865, May 10.—N° 1303.

POKUTYNSKI, STANISLAS and MYCIELSKI, MICHEL.— This invention relates to an expansible apparatus applicable as a substitute for the ordinary piston rods of steam engines. The inventors state as follows :—" The object of our invention is to " obtain increased power from the pistons of steam engines, " whether horizontal or vertical, fixed or movable, marine or " otherwise ; and at the same time reduce the dimensions of the " cylinders in which they work, and by this means economising " both steam and fuel. The piston rod we make use of is so " constructed as to be capable of extension and contraction ; this " is effected by connecting it with several pieces hinge-jointed " together, in short, having the exact form and construction of " the well-known instruments called lazy-tongs, the effect being " to obtain a stroke twice or three times the length of the piston, " by which means a longer lever can be employed. The lever is " attached in the usual manner to the driving wheel ; the other " free end is connected with the jointed piston rod above " mentioned, so that when the jointed rods are fully extended " at the full stroke, on making the return they gradually " contract."

[Printed, 8*d*. Drawings.]

A.D. 1865, May 11.—N° 1305.

JOHNSON, JOHN HENRY.—(*A communication from Peter Riordan.*)—This invention relates to an apparatus applicable to steam boilers. It combines a safety valve, a regulator or pressure gauge, a water level indicator, an alarum, and blow-off apparatus. *It consists of a* duplex cylinder, the upper half of its length being larger in diameter than the lower half. Mounted upon a hollow piston rod there is a large and a small piston, which work respectively steam tight in the correspondihg halves of the cylinder. The space in the cylinder between the pistons is open to the atmosphere. The apparatus is so disposed with regard to the boiler, that the water level therein by means of a connecting pipe is established in the lower end of the cylinder, within which on the surface of the water, there is a float with a vertical spindle, which extends upwards into the hollow piston rod, and carries a certain distance apart two piston valves, which work steam-tight in the rod. Between the valves the spindle carries a toothed rack, which actuates a small pinion connected externally with the finger on a dial, whereon as the float rises and falls, the height of the water is indicated. When by the sinking of the water in the boiler the piston valve falls sufficiently low, it uncovers a small outlet pipe, which communicates with a steam whistle. A safety piston valve and spindle are disposed in the upper end of the piston rod; steam is admitted under this valve from the upper half of the cylinder through perforations in the rod. An adjustable spiral spring on the spindle, reacts at a regulated force against the pressure of steam, and a toothed rack thereon as the spindle rises and falls, operates a pinion connected with a finger, which indicates the steam pressure on a dial plate. When the safety valve rises above the regulated pressure the steam blows off, and when the water sinks below safety level, additional apertures are opened between the piston valves by the sinking of the float.

[Printed, *6d.* Drawing.]

A.D. 1865, May 12.—N° 1324.

HEWITT, William.—(*Provisional protection only.*)—This invention relates to a composition for preventing incrustation in steam boilers, which consists of tanned leather or other substance or material, impregnated with tanner's bark, cut into small pieces, and boiled in water until it assumes a pasty consistence. Soda and tallow or fatty matter are then mixed therewith in the proportion of one part of soda and tallow to 20 parts of the impregnated paste. The whole is then reboiled, and afterwards moulded into blocks of a convenient form and size. The composition is introduced into the boiler either in a solid state, or made semifluid by boiling.

[Printed, *4d.* No Drawings.]

A.D. 1865, May 15.—Nº 1342. (* *)

APPLEBY, Charles James.—"Improvements in steam cranes."

These improvements are thus set forth :—

"This invention consists in an improved form and arrange-"ment of gearing for propelling steam and other cranes on "railways or ordinary roads. The radiating gear is generally, "and by preference, as follows, videlicet, a worm on a shaft, "(usually the crank shaft) gives motion to a worm wheel, on the "under side of which is a clutch box to take a friction clutch. "This worm wheel is carried in bearings on the side frame or "other part of the crane, and revolves (by the motion given by "the worm above named) at right angles with the frame of the "crane. A vertical shaft with a pinion at the bottom gears into "a wheel which is fixed on the crane post and immediately above "the base plate, or into internal gear on the base plate itself; this "pinion is at rest excepting when the clutch is thrown into gear "with the clutch box and worm wheel, and the crane then "'radiates' or revolves round the crane post in the usual manner. "In order to make the crane travel on its wheels I have a large "wheel with gear on its outer diameter, which is loose (not "keyed) upon the crane post, but the pinion gears into it and is "worked in the manner above described. On the under side of "the large wheel last named I place bevil gear, and a pinion "gears into it which is keyed on to a shaft. This shaft is carried "in bearings below the base plate, and has a pinion on the other "end which gears into a wheel or wheels on the one or other of "the axles which carry the travelling wheels of the crane; or I "use a second motion shaft as I find most convenient, which "drives the travelling wheels. In order to travel the crane "backwards or forwards in whatever position the jib may be "relatively with the travelling carriage, I employ a friction strap "on the crane post, or adopt any other convenient mode of fixing "the crane jib in the position it is required to be, and I then "throw the friction clutch on the vertical shaft in gear; this "causes the large wheel to revolve on the crane post, and thus "gives motion to the gearing connected with it and propels the "whole machine backwards or forwards as may be desired, as "more power is exerted in moving the crane than in radiating or "revolving it. When the friction strap or other mode of fasten-

" ing the crane in the position required is released the crane
" radiates or revolves in the usual manner."

The patentee claims particularly, as an essential feature of this invention, " the means of obtaining a longitudinal travelling " motion from the same gear which imparts a radiating or " swinging motion;" along with the combination and arrangement of parts described.

[Printed, 10d. Drawing.]

A.D. 1865, May 18.—N° 1372. (* *)

MOLDEN, Thomas, NEWSOME, John, and AKEROYD, James.—" Improvements in the furnaces of steam boilers." " Hollow perforated," " angular-shaped fire-bars " have the spaces between them " fitted with perforated " plates, able to receive " a " reciprocating or rotating motion externally." The open spaces between the bars may be " occupied by perforated tubes extending " from the front plate of the furnace to the bridge plate," above which the air, which passes in through the tubes, mingles with the flame. They may be made to revolve; or non-perforated stationary tubes can be connected to the feed main. Fire-bars, of a circular section, and perforated, are sometimes made movable, and with their intermediate spaces fitted with movable plates of a segmental section. A water chamber can be erected inside the flue, in front of the dead plate, and communicating by pipes with the hollow bridge.

[Printed, 8*d*. Drawing.]

A.D. 1865, May 26.—N° 1447.

HEINRICH, Jean Alphonse.—This invention relates to an apparatus which will act either as a rotary steam engine or as a pump. It consists of a fixed outer cylindrical case, and an inner revolving piston cylinder mounted therein concentrically upon a shaft, which passes through the ends of the case. Projecting radiatingly from the periphery of the piston cylinder, there are three pallets or pistons, which extend across an annular space formed between the piston cylinder and the internal circumferential surface of the case, against which their extreme ends are fitted to slide round the space in steam tight contact. Two semicircular recesses respectively on opposite sides of the centre, are formed in the case, wherein upon fixed centres are loosely fitted, one in each recess, a steam resistant wheel with four spreading arms somewhat in the form of a Maltese cross; the ends of the arms slide round against the interior of the recesses, and come in sliding contact against the periphery of the piston cylinder. The pressure of the steam, which enters through induction passages at one end of the case at suitable intervals regulated by a circular valve which is operated by a lever, acts in succession on the piston wheel against the pistons, which are thereby driven round the annular space, and cause the rotation of the piston wheel and shaft. As the pistons revolve they come in succession (after the manner of the teeth of gearing wheels) between the arms of the resistant wheels, which are thereby moved intermittently by the encounter of each piston, a quarter of a revolution, the contour of the piston and form of the space between the arms of the resistant wheels being so fashioned in relation to each other as to prevent the escape or passage of steam. When used as a pump the action of the valve is suspended, and motive power is applied to the shaft.

[Printed, 1*s*. Drawings.]

A.D. 1865, May 26.—N° 1451. (* *)

COHEN, MYLIUS.—(*A communication from Louis Phillip Cohen.*) —(*Provisional protection only.*)—Improvements in steam boiler furnaces, according to which the fire-bars are set transversely, and " are cast with rectangular lumps at their ends " fitting " into " slots formed in inclined side supporting bars." These bars " overlap the one the other :" they " form an inclined bed for the " fuel;" and their faces are " inclined," " slightly hollowed " longitudinally," and " wedge-shaped " at the " rear." In locomotives the air is brought " from an under ash-pit," regulated by a valve, and it is led " upwards in front of the ordinary ash-pit to " the upper part of the fire-box."

[Printed, 4*d*. No Drawings.]

A.D. 1865, May 29.—N° 1468.

MOSELEY, HENRY.—This invention relates to engines of the rotating class, for obtaining motive power, and for other purposes. In consists of two cylinders, one concentric within the other, and of such smaller diameter, that an annular space is formed between the two, the smaller cylinder exactly fitting lengthwise to the interior between the ends of the larger. Along the periphery of the small cylinder there is a projecting steam resistant ridge, which extends so far across the annular space, that a packing strip placed in a groove formed along the edge of the ridge, is brought into contact with the internal surface of the large cylinder, thereby longitudinally dividing the annular space. The axis on which the cylinders are mounted is tubular from each end to the centre, where the communication is stopped by the interposition of a diaphragm. Diametrally opposite each other, are two radially sliding piston plates, which fit into deep grooves or recesses formed in the larger cylinder. The grooves are longitudinally disposed on opposite sides of the axis, and diverge beyond the inner circumferential surface, to a depth through the metal, more than equal to the breadth of the annular space, across which when the piston plates are convergently projected, so as to touch the inner cylinder, a portion of each plate will remain in its respective groove, alternately diverging in order that the resistant ridge on the inner cylinder may not come in contact. The axis and inner cylinder are fixed, whilst the outer cylinder revolves and gives off motion and power. The piston slides are moved in and out of the grooved recesses by means of rollers, which traverse eccentric paths formed in cams fixed on the axis. The steam acts in one direction against the resistant ridge, and in the other against the piston slides, and thus cause the rotation of the outer cylinder, as the slides alternately come round and are projected across the annular space. The frictional parts are suitably packed. Modifications are described.

[Printed, 3*s*. 2*d*. Drawings.]

A.D. 1865, May 29.—N° 1469. (* *).

YOUNG, Peter.—" Improvements in the construction of fur" naces " for steam boilers " with two or more flues." Over the fire-doors is fixed a cast-iron box, forming a communication between the two flues, each of which can be closed by a damper. By opening the fire-door and closing the damper of one furnace while the damper of the other is opened, the smoke can return from the first through the box in front, and pass over the fire of the second furnace.

[Printed, 8*d*. Drawing.]

A.D. 1865, May 30.—N° 1479.

HARE, James, the younger.—(*Provisional* protection only.)—This invention relates to apparatus for cleaning the internal surface of tubes, cylinders, and hollow vessels. It consists of a rod, whereon there is a tube of sufficient size to be capable of sliding freely. The upper ends of a number of flexible steel springs arranged round the rod, are secured to its upper end by a metal cap, the lower ends of the springs being correspondingly fixed to the top of the tube, so as to lay, when in a mormal position, longitudinally packed close to the rod. By means of a rack or screw, the tube is slidden up the rod, and each spring is caused thereby to bulge out, so as collectively to form a series of radiating loops or bows. When expanded to the extent required, the apparatus is forced into the cylinder or vessel, and moved to and forth and partly rotated therein. By these means the internal surface is scraped and cleaned, the flexible springs readily yielding and adjusting themselves to the configuration of the interior.

[Printed, 4*d.* No Drawings.]

A.D. 1865, May 31.—N° 1491.

PILKINGTON, PETER. — (*Provisional protection only.*) — This invention, relating to steam hammers, is partly applicable to steam engines. It "consists, first, in making the anvil block of steam " hammers moveable by rack and pinion or other suitable means. " and in applying two or more swage blocks to the anvil block. " By this arrangement each swage block can be brought under the " hammer head." Secondly, "in an improved arrangement of " levers and eccentric to work the slide valve for admitting steam " to the cylinder both above and below the piston. The valve " spindle is jointed to a beam which vibrates on a moveable ful- " crum, the position of which is governed by an eccentric; the " beam above referred to is worked by a lever actuated by the " piston rod or other convenient part of the engine. On this lever " is a sliding block, the position of which is varied by hand; by " this arrangement the length of the stroke of the piston rod can " be varied, and the level through which the piston rod moves " can also be varied." This part of the invention is applicable to steam hammers and other steam engines.

[Printed, 4*d.* No Drawings.]

A.D. 1865, May 31.—N° 1497.

GISBORNE, FREDERIC NEWTON.—This invention for indicating steam or liquid pressure in gauges, and for signalling, "consists of an apparatus to give motion to a hand or pointer on the

" face of a dial having letters or other indications thereon by the " pressure of steam or liquid through tubing in communication " with a corrugated chamber of an instrument similar in its " substantial construction to an aneroid barometer. As the pressure is increased the chamber is expanded, and motion is communicated to the hand or pointer, and so if the pressure in the " chamber be diminished motion is communicated to the hand or " pointer in a manner similar. The motion is given by the " increased or diminished expansion of the chamber, so as to act " on the parts connected with the hand or pointer, as in an aneroid " barometer. For the purpose of signalling the signs are marked " on the face of the dial, and the hand or pointer caused to move " thereto by the pressure imparted."

Numerous practical uses of the invention, as applied to various purposes, are shown and described.

[Printed, 10*d*. Drawing.]

A.D. 1865, June 1.—Nº 1504.

HANCOCK, DAVID, and BARNES, FREDERICK.—(*Provisional protection only.*)—This invention relates to apparatus for obtaining motive power. " Upon a shaft or axle, by preference hollow, " we insert a series of radial arms also hollow and perforated at " their outer ends. To the outer end of each shaft we attach " flexible vessels capable of expansion and contraction, and made " by preference of india-rubber. The hollow shaft is mounted " and is free to revolve on another shaft or axle which is formed " with two valves in it on opposite sides. One of these valves is in " communication with a pipe through which air, gas, steam, or " other fluid is conveyed to one radial arm at a time, and when " air is used from a bellows, fan, or other appliance for generating " the same, the other valve allows the air or other fluid to escape " as hereafter described from the radial arms. Now, to apply the " apparatus we place it in a tank or vessel containing water sufficiently deep to cover or nearly cover the top of the flexible vessels " attached to the arms. Supposing air to be used we admit it to " the arms and thence to the vessels according to the direction in " which the wheel is to revolve, one vessel is first filled, and the " buoyancy thereof causes it to rise and the wheel consequently " to commence rotating; as the flexible vessel rises the next " vessel becomes filled with air by the orifice in its arm coming

" opposite the valve, and so on for all the vessels until they get " over the centre of gravity; the other valve then opens and the " air from each vessel successively escapes as the arms descend " until the vessels are again filled on the other side and rise as " before described."

[Printed, 4*d.* No Drawings.]

A.D. 1865, June 1.—N° 1509.

WRIGHT, THOMAS EDWIN.—(*Provisional protection only.*)—This invention relates to improvements on Bourdon's steam pressure gauge, letters patent for which, bearing date December 13, 1849, No. 12,889, were granted to Charles Cooper. It consists, 1st, in the addition of a portion of nickle to the original proportions of copper and zinc employed in compounding the brass of which the partly circular expansible tube was composed, whereby additional hardness and steel-like flexibility are obtained, and flaws or imperfections in the metal more easily discovered. 2nd. The application of precious stones or other suitable hard material "for " the pinions to work in that retain the lever or levers, quadrant, " and pinion, or, in other words, the mechanical parts in connec- " tion with the finger or indicator of such gauges." The two parts of the invention may be employed separately or combined.

[Printed, 4*d.* No Drawings.]

A.D. 1865, June 2.—N° 1516. (* *)

NUTTALL, JOHN.—" Improvements in valves for steam and " other fluids and liquids."

The improved valves are made of a segmental form, and fitted in a cylindrical box or case. The valve spindle passes through a stuffing box in the lid of the box or case, and projections, with recesses containing springs acting on the segmental valve, are affixed to it. When the valve is opened by the handle on the spindle, the steam or water flows freely through the valve box and through an opening in the bridle connecting the valve to the valve spindle, thus allowing an uninterrupted current to pass from one pipe to another when the valve box is placed in a line of pipes.

[Printed, 8*d.* Drawing.]

A.D. 1865, June 2.—N° 1521.

NEWTON, HENRY EDWARD.—(*A communication from Abram Samuel Mitchell.*)—(*Provisional protection only.*)—The object of this invention, relating to steam boilers, is the more rapid production of steam by a lesser quantity of fuel than is ordinarily consumed. To secure this result, a semicircular false bottom or internal lining is disposed between those boiler plates which are subjected to the greatest heat and direct action of the fire, and the main body of the water, a thin space being left between. The rising of the plate is prevented by suitable stays. The water circulates freely in the thin space, and a considerable portion of the steam is generated therein, rising thence through the body of water into the steam space. The "incrustation usually formed in " boilers is entirely obviated, the sedimentary deposits being " swept away by alternate currents of water and steam into the " trough or space formed by the lining, and from which space " the sediment can be easily removed at pleasure. In adapting " the invention to horizontal and vertical tubular boilers, the " tubes are surrounded or enclosed with a casing of larger diameter " so as to leave a water space between the tubes and the casings " which are kept in their place by means of studs or pins as in " the other arrangement."

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 2.—N° 1523.

SHEPHERD, James.—(*Provisional protection only.*)—This invention relates to safety apparatus for steam boilers. Near to the safety valve a vertical pipe is so fixed in the top of the boiler that a portion of its length is within the boiler, and the other portion projects above. The top of this pipe is closed, and a valve is interposed, the rod of which passes down the pipe and is secured to a float, which, while the water is maintained at a proper working level, by upward pressure keeps the valve close to its seat. Another valve in the pipe is placed above, more weighted than the safety valve. Above this second valve, by means of a bent tube, communication is made with another vessel or pipe, opening into it below a flexible diaphragm contained in an enlargement of the pipe or vessel, and properly secured steam and water tight round the margin. When the float sinks below the safety level, it opens the bottom valve and allows the steam to pass to the second valve, and if the pressure is sufficient to raise it and press upon the water in the bent tube, whereby the diaphragm is *strained upwards* by means of a lever or by its direct action, the safety valve receives an additional lift, and more sudden relief is given to the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 5.—N° 1538.

ROBERTSON, John.—This invention relates to steam engine slide valves, and to the mechanical arrangements for actuating them. According to one modification, the ordinary slide valve is dispensed with. As applied to a pair of inverted cylinders with direct action, grated slide valves are used. These valves have a series of small ports, through which the steam is admitted to the cylinder. By preference, additional ports and similar valves are provided for the exhaust; these are quite independent of the induction ports and valves. The required amount of traverse is imparted to the valve by a short lateral spur or toe, fixed within the valve chest upon a vibratory vertical shaft, which obtains motion by means of a lever arm on its outer end, working in combination with a cam mounted on a counter shaft. This cam is a broad ring of metal, eccentrically grooved round its circumference, partly in an oblique direction to the right, and partly to the left, in order to unite with two parts of the groove which run round opposite parts of the cam in concentric lines. A small roller upon a stud, laterally fixed in the free end of the lever arm, works in the eccentric groove, whereby as the cam revolves, oscillatory motion is imparted to the lever and shaft, and through them by means of the lateral spur, to the valve. A single grooved cam is used for working the exhaust, but for the steam valves a double grooved cam is employed, and two vibrating shafts, one within the other, each carrying a spur in the valve box and a lever arm on their outer free ends, to work respectively in the eccentric grooves.

[Printed, 10*d*. Drawing.]

A.D. 1865, June 5.—N° 1542.

TOLHAUSEN, Frederick.—(*A communication from Eugène Dutheil.*)—(*Provisional protection only.*)—This invention consists in converting the steam cylinder of a locomotive engine into a compressed air break. This is effected by means of an *intermediate valve plate*, interposed between the slide valve and the cylinder port surface, with the port openings in which it corresponds. The slide valve is actuated in the usual way, and works on the back of the valve plate, which is immovable when the train is travelling on, and is only brought into operation when the train is required to slacken speed or stop, when by means of a hand lever and suitable connections, under the control of the engine driver, the plate valve is made to cover the ports, at the same time that a valve, which remains closed while steam is working in the cylinder, comes into operation, and admits air when the steam is shut off. Whilst the momentum of the train lasts, the motion of the engine continues, and at each stroke of the piston air is drawn into the cylinder, which forms a cushion or air buffer, and so by degrees, either in conjunction with or without the aid of ordinary breaks, the progress of the train is gradually stopped by its own momentum; the expulsion of the air from the cylinder when the steam is turned on, takes place through the egress valve provided for the purpose.

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 7.—N° 1555.

DUTERNE, Victor. — This invention relates to a metallic "self-closing" stuffing box or packing, which consists of a metallic sleeve, longitudinally divided into two parts; this sleeve fits lengthwise into the stuffing box; it is biconical, tapering from the centre towards the ends. At the bottom of the box a compressed spiral spring surrounds the lower end of the sleeve, and presses a divided circular wedge towards its mid-length, which wedge is shaped to correspond with the tapering form of the sleeve, and fill the surrounding space; another similar wedge fits into the top of the box, and is pressed in by the cap against the resistance of the spiral spring at the bottom. The manner in which the sleeve is divided ensures a good fit round the shaft, and the conical wedges by means of the cap and spring prevent any escape of steam. The spiral spring may be substituted for one of india-rubber. The sleeve and conical wedges are made of soft metal.

[Printed, 8*d*. Drawing.]

A.D. 1865, June 7.—N° 1559.

BARFF, Arthur, and SIM, Elizabeth Lochart, executrix of **William Sim.**—*This invention* relates to generating heat, for producing steam and for other purposes, by the combustion of inflammable fluids or oils. When applied to a steam boiler, the generating vessel is placed in the furnace, and heated to a high temperature by means of a fire placed beneath it or at the sides. The fluids employed may consist of inflammable oil, such as either petroleum, paraffin, shale, or other mineral oil, hydrocarbon, and animal or vegetable oil, which is admitted to the generator in a small continuous stream, or is dropped therein in regulated quantities. The gas which is generated issues from the generator through a numerous arrangement of burners, which are inserted into perforations made at regular distances all over the upper part of the vessel, where the gas is ignited and burns on its outer surface.

The more important part of the invention consists in adding to the unconsumed carbon, a sufficient quantity of oxygen and hydrogen to ensure its complete combustion. This is effected by directing drops or jets of water into the generator whilst the latter is at a high degree of temperature; the water decomposed is resolved into its constituent gases, which by mingling with the surplus carbon, produce an inflammable gaseous compound that quickly consumes. Modifications are described.

[Printed, 10*d*. Drawing.]

A.D. 1865, June 7.—N° 1561.

NEWTON, William Edward. — (*A communication from Estus Lamb and Henry Stephen Mansfield.*)—The object of this invention is to obviate the violent fluctuations of steam engine ball governors, and the consequent changes in the supply of steam, when any sudden increase or decrease of resistance to the work of the engine takes place. It consists in the use of a revolving screw rod to form the connection between the governor and the throttle valve, in combination with an arm upon a rock shaft connected with the valve or spindle: the rod passes through the end of the arm, and according to the direction in which it turns, the valve is more or less opened or closed, independent of or in opposition to the action of the governor, being partially closed, when, by a sudden check upon the engine, the balls sink, and partially opened when, in consequence of a decrease of resistance, the balls fly out. The rotary motions of the screw rod are *governed by* an escapement wheel with two oscillating pawls.

An adjustable hinged shoe is so applied to the wheel, that by means of a spring bar while the engine is running at its normal speed, the pawls remain inactive, but begin to operate respectively in opposite directions, one to increase, and the other to diminish the supply of steam, coincident with the changing position of the governor balls. The position of the shoe is regulated by a cam slot in a rod, which follows the rising and falling of the balls.

[Printed, 8*d*. Drawing.]

A.D. 1865, June 9.—N° 1575.

VERNON, Charles, and HODGKINS, William.—(*Provisional protection only.*) — This invention, relating to safety valves, is also applicable to steam engine and other valves. With regard to safety valves, two valve seats are formed in a vertical pipe or chamber; both valves are fitted upon a central spindle, the area of the upper valve being larger than the valve below; the lower end of the spindle, which extends beneath the bottom or smallest valve, carries a weight, which is equal in lbs. pressure to the difference between the areas of the two valves in relation to the working pressure of the boiler. The steam is admitted between the valves, both of which, when excess of pressure occurs, simultaneously rise and permit the escape of steam, either direct into the atmosphere, or from the top of the valve spindle, which may be made hollow, with suitable lateral openings communicating with channels for the passage of the steam. Steam and exhaust valves, for steam and other engines and machines, may be constructed on the principle described.

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 12.—N° 1590. (* *)

BROOMAN, Richard Archibald.—(*A communication from François Durand.*)—Improvements more especially relating to a mode of feeding all kinds of furnaces. Over the top is a hopper, the bottom of which is formed by a fixed disc or plate with holes. On this disc is a corresponding one adjustable from the outside, in order to regulate the area of the apertures. Above both these discs is a third, formed with one " radial aperture," and which is caused to rotate, and thereby " distribute the fuel." Another plate above this, formed with cutting teeth, may be used to break up the fuel in *the hopper*. The same shaft carries an eccentric for giving a vibratory motion by means of a rod to levers fitted between the fire-bars. With vertical boilers the furnace is set in an annular water space, and the gases are carried off by serpentine flues.

[Printed, 8*d.* Drawing.]

A.D. 1865, June 13.—N° 1602.

ROUTLEDGE, Thomas, and RICHARDSON, William Henry.—This invention relates to the manufacture of paper and paper stock, and to the utilization of certain waste products for treating fibrous substances, and also for preventing incrustation in steam boilers.

1st. Treating in the boiling process, esparto or alfa, straw, fibrous substances, and rags, with leys obtained from the lixiviation with water of black balls, manufactured in alkali works, or made for the purpose.

2nd. Relates to pressing out or extracting from fibrous substances after the boiling process, so as to save as much as possible for future use of the alkaline and extractive matter; also to flatten and open the fibres, and free them from extraneous matter ready for conversion into "stock" or for bleaching. For this purpose an hydraulic press or a hydro-extractor is employed.

3rd. Boiling down the alkaline liquor thus obtained, either alone or with spent leys or waste liquors produced in the ordinary manner, and incinerating the mass produced. The result may be lixiviated in the usual way, and the liquor obtained used alone or mixed with the leys commonly employed for treating esparto or other fibrous material.

4th. Adding to the pasty mass, coal, coal tar, pitch, or other suitable substance, either alone, or with any of the substances ordinarily used, or capable of being employed in the balling process at the alkali works.

5th. Adding to the leys or liquors so obtained, or to the product obtained by boiling them, either caustic or any suitable salt of baryta, and applying the purified solution for boiling esparto and other fibrous materials.

6th. Using the pasty mass resulting from boiling down the waste liquors, for preventing incrustation in steam boilers.

7th. Using an aqueous solution of chlorine gas instead of a *solution of bleaching* powder, or using a solution of chlorine in water containing magnesia, alumina, soda, or potash, for bleaching esparto and other fibrous substances, and, if desirable, increasing the energy of the bleaching agent by the addition of sulphuric or other acid.

[Printed, 4*d.* No Drawings.]

A.D. 1865, June 14.—N° 1607.

MASSEY, Benjamin, and MASSEY, Stephen.—This invention relates to the valves of steam hammers and other steam-power machines. The free end of the main valve rod of the steam cylinder, carries a piston which works in a small cylinder. Into this small cylinder steam is admitted by two slide valves, which move on a facing in which are two ports which communicate with the ends of the small cylinder and two with its exhaust. These valves are moved simultaneously but separately by radius bars, each valve covering one steam port and one exhaust. The fulcra of the radius bars or levers are carried by adjustable excentric studs, fixed respectively to each side frame, and the free ends of the radius levers are moved by the motions of the tup, so that whilst the machine is in operation, the small valves are always in motion, and either of them, by means of the excentric studs respectively, can be so moved as to admit steam at longer or shorter intervals to actuate the piston in the small cylinder, whereby the slide valves of the main cylinder are operated, and the motion of the machine brought under control. For the purpose of guiding the tups while falling, they are provided with facings, which slide against correspondingly faced guides in the side plates.

The hammer head of a "helve" or "Oliver" hammer, is raised and depressed by a steam piston in a cylinder either fixed or oscillating, having suitable adjustable arrangements for working the valves. By means of a foot lever, the hammer may be made to deliver a single blow. The fulcrum of the helve is supported and made to move either in a line or curve by means of a steam cylinder and piston or by water pressure.

In machines for cutting, forging, punching, and other such purposes, a strong lever supported on a fulcrum near one end, which carries the blade, punch, or die, is introduced, the corresponding blade, punch, or die, being fixed to the framing, which is conveniently shaped for the purpose. The long end of the lever is actuated by its connection with a steam cylinder and piston, which is fixed to the frame, and may be either single or double acting.

[Printed, 2s. 6d. Drawings.]

A.D. 1865, June 15.—N° 1620.

BROOMAN, Richard Archibald.—(*A communication from Felix Alexandre Testud de Beauregard.*)—(*Provisional protection only.*)—This invention, relating to the combustion of carbonaceous fuel, is applicable to steam boiler and other furnaces. The inventor states :—" Into a furnace of any form I introduce the " fuel through an opening in the upper part of the furnace. In " the side and near the bottom of the furnace I form an opening " for lighting it, and calculated so as to permit the entrance of " air in proportion to the section of the pipe " employed " for " leading the gases above the grating; these openings are com" pletely closed except to a pipe for admitting air brought in by " the jet of superheated steam. The gases produced issue by the " pipe before mentioned to the grating and take from the air all " the oxygen capable of producing complete combustion. This " air is distributed in the gases in sheets passing between the " bars and becoming mixed with the gases by the draught pro" duced by the chimney. The products of combustion, azote, " steam, and carbonic acid are drawn in the ordinary manner by " a chimney, which causing a drawing of air supports the com" bustion or rather the ignition of the combustibles and allows " the gaseous products to become disengaged, without being " consumed, the oxygen of the air having been transformed into " oxide of carbon by its passage through the inflamed fuel in the " furnace. The gas travelling at a speed proportioned to its " expansion and to the draught is compelled to escape into the " flues after having received the quantity of air necessary for " ignition. If instead of the drawing of the air caused by the " chimney the air be forced at the required pressure by a blowing " machine or otherwise a strong and rapid formation of com" bustible gas is obtained. The decomposition of the steam at " a high temperature furnishes its contingent of the production " of hydrogen, and forms an additional blowing machine, the " pressure of which may be regulated as required."

[*Printed, 4d.* No Drawings.]

A.D. 1865, June 15.—N° 1622.

BOULTON, Matthew Piers Watt.—(*Provisional protection only.*)—This invention relates to generating steam in such a way as to obviate the disadvantage arising from the deposit, by the boiling water, of earthy and saline matter, which become incrusted upon the metallic heating surfaces of the boiler. The inventor proposes to employ the heat of the furnace to superheat steam, and to generate steam in the boiler by causing the steam thus superheated to pass through the water by means of a forcing apparatus of sufficient power to overcome the boiler pressure. Any of the ordinary modes can be employed for superheating the steam, which may be made to pass through the water in the boiler in numerous small streams, through perforated plates, or be made to take a zig-zag course by means of plates or surfaces suitably disposed. In order to dry the newly generated steam, a portion of the superheated steam is admitted to the steam space. Air heated in the superheating apparatus is employed to produce the first steam, and may afterwards be allowed to mingle with the steam generated, or be discontinued. The products of combustion may be made to draft through a closed vessel containing heat absorbing bodies, upon which, when sufficiently heated, water may be injected, in order to produce the steam necessary to start the apparatus.

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 20.—N° 1662.

VIGNIER, Evariste.—(*Provisonal protection only.*)—This invention relates to distilling and rectifying, and is in part applicable to steam generators. It, in the first part, proposes to adopt the use of enamelled wrought or cast iron, for the construction of the vessels employed in the process of distillation, rectification, and generating steam.

It proposes secondly, to employ in the stills and rectifiers engaged in the production of alcohol, one or more filters of charcoal or other disinfectant, so placed that the ascending vapours shall be compelled to pass through such filters, in order to arrest the essential oils or phlegms, and thereby, according to the number of filters employed, purify the spirit, which is subsequently run off. The produce from the distilling passes through the rectifying apparatus; the flavouring ingredients may be introduced into a boiler, and the vapour be made to pass through a chamber connected with the rectifier, so as to avoid the risk of charring or burning.

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 21.—N° 1669.

PORTER, Charles Talbot.—This invention relates to surface condensers, and consists, 1st, in causing the circulating water before it enters the condenser, to pass through a casing which encloses the air pump and the pipe leading from the condenser. The pump which supplies the circulating water is disposed above a series of foot valves; the delivery valves are arranged in series above the pump, and open into the chamber which contains the air pump cylinder; thence the circulating water is forced forward to the condenser, through the casing which encloses the pipe leading from the condenser to the air pump. By this arrangement, the temperature of any vapour present in the pump or pipe, is lowered and condensed, and is driven out by the pump with the condensed steam. The size of the pump may be less than the usual dimensions. 2nd. Employing the air pump as a force pump to supply the boiler. Interposed in the connecting pipe there is an air vessel which forms part of the water channel; the air drawn from the condenser rises to the top of this vessel, and is by a cock or other suitable means periodically discharged.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1865, June 22.—N° 1672.

GODFREY, Samuel.—This invention, relating to furnace-bars and fire-grates, consists in forming fire-bars with a number of lateral projections at regular intervals along each side, so that the projections of one bar, come between the projections of the contiguous bars, and leave interspaces for the upward passage of air. The ends of these bars rest in hollow bearings, and by means of suitable contrivances, consisting of arms severally fixed on the end of each bar, and united by connecting links, which are actuated by a hand lever or otherwise, a rocking or semi-rotative motion is simultaneously imparted to the bars. The upper surface of each bar is grooved longitudinally, and transversely on the projections. By these means all substances adhering to the bars are crushed or broken up, and increased facilities for the admission of air through the bars are thereby provided. There is also an air way at the rear of the fire-bar range in front of the bridge. A variety of details are illustrated. The invention is applicable to the furnaces of steam boilers, and also to reverberatory and other furnaces.

[Printed, 10*d.* Drawing.]

A.D. 1865, June 22.—N° 1677.

NEWTON, WILLIAM EDWARD.—(*A communication from Alban Crocker Stimers.*)—This invention relates to a mode of fixing the tubes in the tube plates of surface condensers, so as to provide for the expansion and contraction caused by and between each influx of steam. The methods employed by "Hall," "Ericsson," "Pirsson," and by "Sewell" are referred to. The invention consists in fixing one end of the tubes, by screwing or otherwise, into a tube plate of ordinary thickness; the corresponding tube plate is double the ordinary thickness, being 1½ inch for tubes of ⅝ of an inch in diameter. The tube ends are carefully fitted into plain parallel holes reamed to the exact external size of the tubes, so that, although there is no leakage of either steam or water, the tubes when expansion or contraction takes place, slightly slide to and forth in the holes, and thus are formed simple and cheap slip joints, possessing but little liability to derangement.

[Printed, 8*d.* Drawing.]

A.D. 1865, June 24.—N° 1697.

CLARK, WILLIAM.—(*A communication from François Auguste Fouché and Claude Moret.*)—(*Provisional protection only.*)—This invention, relating to the means and apparatus for consuming smoke in the furnaces of steam boilers, effects the subdivision and purification of the products of combustion; the solid part or carbon which produces the smoke being first separated, the combustible gases, such as oxide of carbon, carburets of hydrogen, and hydrogen, are consumed afresh, and the burnt carbonic acid and steam are condensed.

The apparatus may be applied to an ordinary boiler, fixed or set in the usual way in connection with a chimney, the flue of which is closed by a damper, and the smoke and hot draughts from the fire are by means of a flue pipe, discharged into a chamber below the surface of water contained therein, the end of the flue pipe which enters at the top of the chamber being turned down for that purpose. Here the purifying process commences, the products of combustion being deprived of some of their constituents, such as fine particles of coal and ashes, which sink to the bottom of the water. Thence the gaseous products pass into a purifier, which is a chamber furnished with a number of horizontal partitions formed of perforated plates, dividing the chamber into separate compartments, wherein upon the surface of each partition plate, is spread a quantity of lime mixed with hay, moss, or spongy matter, through which in succession the gaseous products are caused to permeate. The carbonic acid by combining with the lime, transforms the latter into carbonate of lime. The lower space in the purifier contains milk of lime, wherein the then purified inflammable gas is washed, and drawn off by means of a fan into the exhauster, where it is supplied with a due proportion of atmospheric air, and then forced through a suitable pipe under the furnace bars. The ash-pit is closed, and no other air admitted to the furnace.

[Printed, 8*d*. Drawing.]

A.D. 1865, June 26.—N° 1700.

ASHBY, Morris.—This invention relates to refrigerating apparatus for cooling liquids and condensing steam and vapours. The refrigerator is so constructed with one tortuous main channel for the cooling liquid and another conduit channel for the liquor or vapour to be cooled or condensed, that a continuous stream of both is constantly passing through in opposite directions, an inlet for one and an outlet for the other being situated at each end of the apparatus. The main channel for the cooling liquid is formed by a series of pipes placed parallel with each other side by side, alternately united near the top, and intermediately near the bottom by flanged lateral branches, so as to form a continuous channel through. The ends of these main pipes are flanged to receive the flanges of metal bends which are bolted thereto, whereby the ends of the main pipes are alternately connected along one side of the apparatus, and intermediately by other bends along the other side. Longitudinally extending the whole length within the main pipes, and fitting between the flanges of the bends, is a number of flattened or other shaped *pipes or conduits*, which form a separate continuous passage for the liquid or vapour to be cooled or condensed; this current enters at one end of the apparatus in a continuous stream, passing in succession through the several series of flattened pipes or conduits contained in the main channel pipes, by means of the bends, whilst the stream of cooling liquid enters the apparatus at the opposite end, and passes through the interspaces in the main pipes, and on through them in succession from main to main by means of the lateral branches.

[Printed, 10*d*. Drawing.]

A.D. 1865, June 29.—N° 1734.

NEWTON, Willam Edward.—(*A communication from Charles James Eames.*)—This invention relates to the purification of feed water by filtration, for the purpose of preventing incrustation in steam boilers. The object is effected by the use of layers or strata of native or artificial carbonate of baryta, which may be alternately combined with layers of siliceous sand, sponge or similar substances, and oxalate of baryta, as media of filtration for water holding in solution sulphate or carbonate of lime, or other earthy substances known to cause incrustation. The filter is constructed over a tank or reservoir, and half filled with alternate layers of the sand, and baryta or "witherite," in coarse powder. The course of the water may be either upwards or downwards through the filtering bed. The sulphate of lime and earthy salts are converted into carbonates of lime, alumina, and other salts, which are in turn decomposed by the oxalates of baryta, and converted into insoluble oxalates of lime and carbonate of baryta.

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 30.—N° 1737.

SCHOFIELD, William.—This invention relates to the construction of furnaces for burning gas retorts, generating steam, and other purposes, also to the manufacture of retorts and similar articles.

With regard to furnaces—the fire-grate surface is formed by a series of round rods or bars, their back ends resting in recesses formed in the back transverse bearing bar. The front ends of the bars pass through a series of holes in the dead plate, and project outside under the furnace door. Fitted in front upon the extreme end of each bar there is a worm pinion, and transversely disposed in suitable end bearings, so as to correspond with all the pinions, is a revolving screw shaft, which when set in motion communicates simultaneous rotary motion to each bar. The external form of the bars may be varied, and instead of moving them simultaneously by mechanical means, they may be rotated separately by hand gear.

In order to prevent the cracking and fracturing of fire-clay articles, and gas retorts, arising from contraction and other causes, they are moulded and cast with a multitudinous arrangement of holes or apertures, which are filled up with burnt plugs of fire-clay and cement, after the article or retort is burnt. These retorts are arched at top and made much narrower and deeper, in order the better to sustain their weight when resting or supported only at their ends; and screw threaded holes are moulded in their front ends to receive screws for the purpose of securing the mouth piece or cover.

The retorts are moulded in sections, and by means of a sheet metal cap, the portion moulded is covered and thus protected from the drying effects of the atmosphere until the work is complete.

[Printed, 10d. Drawing.]

A.D. 1865, June 30.—N° 1745.

ELLIOTT, Edwin.—(*Provisional protection only.*)—This invention relates to the furnaces and other parts of steam boilers. It is adapted principally to vertical boilers, such as are usually employed to generate steam for the propulsion of canal boats and small steam tugs. These boilers are generally made with a central furnace, and a narrow annular flue disposed in the surrounding water space. The invention consists in disposing a bridge or a water space between the rear of the fire-grate surface and the back of the furnace, in order to prevent the choking up of the fire draught passage, through which the burning products of combustion pass from the furnace into the flue, the passage being arranged considerably below the ordinary level. Partition plates or water spaces, are sometimes disposed in the flues for the purpose of prescribing the course of the burning gases, whereby to effect their more equal distribution over the heating surfaces. Two blast pipes are employed for the exhaust steam; ordinarily *both are open*, but when it is desired to clear deposits from the flue, the upper blast pipe is closed, and the full blast is sent through the lower pipe at the foot of the chimney, which produces the desired effect. The hinge of the chimney, to prevent the rising of the upper section when it is turned down to pass beneath bridges and tunnels, is fitted to act below the plane of the joint.

[Printed, 4d. No Drawings.]

A.D. 1865, July 3.—N° 1754.

DE BERGUE, CHARLES.—(*A communication from Auguste de Bergue.*)—This invention relates to locomotive engines and consists in constructing such "engines with or applying thereto an " air chamber or chambers, which may be heated or not, and " valves and valve gearing, whereby when the steam is shut off " and the ordinary valve gearing reversed the cylinders may be " converted into force pumps for condensing or pumping air into " the said air chamber or chambers, whereby the gradual increase " of pressure thus produced may oppose a gradually increasing " and accumulated elastic pressure or resistance to the pistons, " and consequently to the onward motion of the locomotive or " train. Also in so constructing locomotive engines that the air " compressed as above may by means of pistons or small cylinders " press against timber or metal friction blocks or brakes placed " against the non-driving wheels of the engine, or against the " wheels of the tender, or direct on to the rails for assisting the " retardation. The invention also includes valves for the purpose " of closing temporarily the present exit of the blast pipe, and " admitting air into it to supply the cylinder otherwise than " through the funnel, thus avoiding the inconvenience of dust or " grit in the valves, the inlet of air being by pipes or passages " from the outside. Also the employing a small jet of steam to " lubricate the said valves and the pistons when working for re- " tardation. Also the applying safety valves to the air chambers " to limit the pressure, which valves may or may not be under " the control of the driver."

[Printed, 10d. Drawing.]

A.D. 1865, July 3.—N° 1759.

NAVEAUX, JOSEPH.—This invention relates to stopping and retarding locomotive engines and carriages by the application of steam breaks. A duplex cylinder is fixed to the under side of the side frame of each carriage between the wheels, and also to the engine if desired. The piston rods of two pistons work out at the opposite ends of the cylinder, at an angle inclining downward towards the centre of each wheel. The steam is admitted between the pistons, which diverge with the pressure, and operate in opposite directions upon breaks attached respectively to the end of each piston rod, or to intervening links, whereby they are pressed against the periphery of the wheels. The ends of the cylinder are open, the piston rods working out through pieces fixed across, which serve them for guides. After the breaks have operated they are moved back by the reaction of helical springs, disposed within the cylinders between the pistons and the cross pieces. A steam pipe, in communication with the central chamber between the pistons, is attached to and extends along each carriage, and these pipes are coupled together by flexible junction pipes. A cock placed near the boiler regulates the admission of steam, which acts simultaneously on all the breaks, and a second cock stops the action of the breaks by letting off the steam.

[Printed, 8*d*. Drawing.]

A.D. 1865, July 3.—N° 1760.

BENSON, Martin.—This invention relates to steam pumping engines, which are constructed on the direct reciprocating double-acting principle, the piston of the steam cylinder and the piston of the pump cylinder being mounted on the same piston rod. The two cylinders rectilineally disposed, are fixed on a suitable bed plate of metal, or on a timber foundation, the steam valve being worked by rods connected to an arm attached to the piston rod and moving to and fro between the cylinders. Instead of an ordinary slide valve, a conical steam valve, fitted in a correspondingly shaped valve case is used, and the pressure necessary to render the valve steam-tight, is regulated by a hand screw. The pressure on the valve is balanced by cutting openings in the case opposite the steam ways with which they are made to communicate. The arrangement of levers for moving the valve, and the steam openings are so regulated, that steam is admitted to the ends of the steam cylinder in time to prevent the contact of the pistons with the cylinder covers, and stop-guides are provided to prevent any over action of the valve. The steam engine cylinder and details may be combined with pumps of any ordinary construction.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1865, July 4.—N° 1769.

WILSON, James Edwards.—This invention relates to locomotive engines, and to springs for railway carriages. In the construction of a locomotive engine, it may be necessary to mount it on four, or more than four pairs of wheels, which are coupled together by outside crank pins, the side coupling rods respectively being actuated by crank arms fixed on the ends of a central crank shaft, which is driven by a pair of cylinders situated between the side framings, the driving crank arms on the ends of the shaft being formed at right angles to the piston cranks. The forward and hinder axle boxes have a short play allowed between their horns, thereby giving endway liberty to the boxes and axles, in order the more easily to follow round curves in the line of road, provision being made by allowing end play on the crank pins, for giving corresponding liberty to the coupling rods. The plates which cover the boiler fire-boxes are dished, whereby sufficient resistance against internal pressure is obtained without the use of roof stays.

Railway carriage springs are composed of a series of straight steel plates, so arranged that the number of plates which come into action is regulated by the weight of the load, so that whether the load be light or heavy, it is borne by the springs with a uniform amount of elasticity.

[Printed, 2*s*. 4*d*. Drawings.]

A.D. 1865, July 5.—N° 1778.

LOW, George.—This invention, which relates to the construction of, and application of motive power to machines for boring rocks and hard substances, is supplementary to a prior invention for which Letters Patent dated April 9th, 1863, No. 903, were granted to this inventor.

The apparatus comprises a wrought-iron cylinder, and an inner working cylinder of brass, which is free to move to and forth and rotate at the same time upon its longitudinal axis. The back end of the working cylinder is made steam-tight by suitable packing, and a portion of steam or air is retained in the interspace between the ends of the cylinders, to act as a cushion between the succeeding strokes of the working cylinder; a circular valve, with admission and emission ports, admits the steam or air at the proper time for projecting the piston from the working cylinder, which at each pulsation delivers the operating blow. The boring tool as it penetrates the rock, is kept to its work by means of two serrated side bars, and two cam bars, which are made to engage the notches in the side bars each time the working cylinder sends forth to deliver the blow. The ends of these side bars are pointed, for the purpose when pressed against the face of the working, of steadying the apparatus. Other plans and devices are resorted to for advancing the tool to its work, and modifications of the constructive arrangements, and of the various details required for performing different mining operations, are described and illustrated.

[Printed, 8*s*. 4*d*. Drawings.]

A.D. 1865, July 10.—N° 1820.

LYTTLE, WILLIAM ALEXANDER.—This invention relates to steam generators. The furnace of a steam engine boiler is supplied with air by means of a force pump, and when at work, all the gaseous products of combustion are made to pass into the boiler, and thence through the cylinder. The fire chamber is fitted with suitable ports and air-tight valves. The air forced into the furnace produces intense heat, and the gases emitted thereby, pass off through suitable valves and are afterwards commingled with the steam in the boiler, so that the whole of the heat obtained from the fuel is utilized. Suitable arrangements are made for the supply of fuel to the furnace, and an opening provided for the removal of ashes, and the admission of air to the fuel, when the fire is first lighted, or when the boiler is being worked in the ordinary manner with a free air draught. A pail full of milk of lime is occasionally poured into the boiler to purify the gases, and dust or soot is prevented from lodging in the mouth of the valve by means of a sliding plate. Arrangements burning petroleum under compression, which fluid is partly or y injected by the air pumps, are described and illustrated.

inted, 1s. Drawing.]

A.D. 1865, July 10.—N° 1821.

BROOMAN, Richard Archibald.—(*A communication from Joseph Alphonse Loubat.*)—(*Provisional protection only.*)—This invention relates to steam carriages. The driving power, which comprises two steam cylinders supplied by one generator, is placed at the fore part of the carriage. The piston rods are connected by links to two cranks on an auxiliary shaft, which carries a chain-wheel, whence, by means of an endless chain and chain-wheel upon the front axle, which carries the driving wheels, motion is imparted thereto. The axle bearings are made movable for the purpose of adjusting the necessary tension of the chain. The steering is effected by the movements of the hind axle and wheels, which swivel on a disc and central pivot in the ordinary manner, when actuated by a hand wheel mounted upon a vertical rod and under the control of the driver. Movable flanges in segments are fitted to the tires of the wheels for the purpose (when required) of running upon rails, but when running upon ordinary roads these flanges are removed.

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 11.—N° 1834.

JENKINS, Nathaniel.—This invention relates to steam and water valves, formed of india-rubber or other suitable elastic material, and fitted to act upon metallic seatings. It consists—

1st. In confining the elastic valve to the valve follower, or to a swivel connected therewith, by means of a flange of the same elastic material, formed round the valve to fit into a corresponding annular recess formed inside a socket on the end of the follower or swivel, for the purpose of readily inserting or removing the valve from the valve box.

2nd. Attaching the elastic valve to the end of a plug or swivel pivoted to the follower, so that the valve whilst being screwed down shall not rotate and rub upon its seat.

3rd. Employing a compressible valve of india-rubber or other elastic material to answer the triple purpose of a spring, a cap, and a valve. The fluid ways are uncovered by the compression of the valve, and closed by its reaction when the pressure is removed.

4th. Relates to a self-closing valve, which operates by means of the fluid pressure in conjunction with a spring, causing a coarse pitched screw on the follower, to turn when the hand is removed from the handle.

5th. Employing an adjustable stop, which is fitted to the follower spindle of a steam or water cock, for the purpose of regulating and preventing excessive compression, and so avoid injury to the elastic valve.

6th. Arranging a waste or discharge orifice through the valve cap, for the purpose of discharging the water which remains and might freeze in the valve chamber after the valve is closed, the orifice being closed by the valve when the latter opens.

[Printed, 8*d.* Drawing.]

A.D. 1865, July 11.—N° 1836.

KEENE, MORRIS HORSEY.—(*A communication from Alexander Keene Richards.*)—This invention relates to traction engines. First, to the driving wheels, which (to prevent their slipping on soft ground or otherwise) are furnished with a series of radiating bars. These bars are severally disposed between the spokes; their outer ends carry two prongs or claws, which respectively slide in radial guides attached to the opposite sides of the rim of each wheel. At the proper time, by means of excentric cams or by springs, the claws are divergently projected beyond the periphery of the rim, and forced into the ground at the sides of the wheels, without disturbing the soil on which they immediately rest.

The second part describes the general disposition and arrangement of the parts of the traction engine. A vertical boiler is employed. Two steam cylinders mounted respectively towards the fore end of the side framing, give motion to a transverse crank shaft, whereon are three toothed wheels of different diameters, which according to the required difference in speed, severally by suitable means bring into activity corresponding toothed wheels upon the driving shaft, which by the aid of a pinion at each end, actuates the driving wheels, provision being made for throwing one or other pinion out of gear whilst turning or guiding the engine round curves. The driving wheels are dished, and the axle is divided into two parts, which are set in blocks at a proper angle for bringing the weight of the engine directly over the point of contact with the road. A crab may be fitted on the fore part of the engine. The steam pipes are fitted with expansion joints, and the boiler with a regulator, so that the man who steers also manages the engine, the front wheels being connected to an ordinary fore carriage, which is operated by the steering apparatus. The engine frame is composed of iron plates and angle iron rivetted together. Other minor details are fully described.

[Printed, 2*s*. Drawings.]

A.D. 1865, July 18.—N° 1869.

BARCLAY, Andrew.—(*Provisional protection only.*)—The object of this invention is to increase the heating surface of steam boilers or generators, which is effected by the introduction of tubes into the furnace. The tubes are bent to the form required for inserting their upper ends into the crown or upper part of the furnace, and their lower ends into the sides or lower parts of the furnace, near to the fire-bed, thereby forming a series of water communications between those upper and lower water spaces which are contiguous to the fire. Thus arranged and exposed to the fiercest head, a constant circulation of water is set up in each tube, and a continual upward stream of water from the lowest water spaces of the boiler to the upper, is maintained. The arrangement of the tubes may be modified by disposing them diagonally, either straight or curved, across the furnace, and sufficiently inclined to ensure an upward circulation of the water within them.

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 20.—N° 1893.

BRISTOL, Richard Clark.—This is a supplementary invention relating to steam engine slide valves. The patentee states as follows:—" In the Specification of a Patent granted to John
" Henry Johnson for an invention communicated to him by me
" . . . . . dated the 20th of November 1863, No. 2927, there
" is described a steam engine slide valve supported on rollers
" which are interposed between the valve and the face on the two
" sides, so that when at work these rollers on the two sides carry
" the greater part of the pressure of the steam on the valve, and
" there is but little friction between the valve and its face; the
" rollers, however, being in this arrangement independent the one
" of the other, are liable to congregate together or otherwise get
" deranged in their position, and then they fail to work efficiently,
" and do not give the valve a proper support. According to my
" present invention I mount all the rollers in the same series in a

" frame which keeps them at their proper distances apart, pins " carried by the frame passing loosely through holes at the " centres of the rollers. The rollers, as before," travelling with the valve a distance equal to half the length of its stroke, are prevented traversing too far towards the end of the valve by their frame, the ends of which alternately abut against stops or the ends of the valve case, whereby the rollers are always kept in correct position under the valve.

[Printed, 1s. Drawings.]

A.D. 1865, July 20.—N° 1897.

PARRY, Morgan Lawrence.—This invention relates to a condensing apparatus for high and low pressure steam engines. It consists of a vertical cylindrical casing, superposed on a cast metal dished chamber, which opens centrally downwards into a vertical discharge pipe in communication with the hot well. Towards the upper part, the casing is increased in diameter, so as to form a top cylindrical chamber, which is closed by a steam tight hemispherical crown or cover. It contains a central steam pipe, which terminates in an open end near the top. The lower end of this pipe opens into a lateral branch in communication with the pipe through which the engine discharges its exhaust steam. The annular space in the casing is divided by a second concentric pipe, bell-mouthed at top, and covered by a perforated convex plate, which closes around the upper end of the steam pipe; an annular perforated plate near the top, closes the annular space between this second pipe and the casing. A lateral branch forms a communication between the interior of the second pipe and a donkey pump. The exhaust steam rises up the central pipe into the top chamber. The condensing water is forced up the second pipe and through the perforations in the convex cover amongst the steam, descending thence in a shower mingled with the water of condensation and steam, through the perforated plate, and down the external annular space, to the cast metal dished chamber into the discharge pipe, which reaches to a depth of over 34 ft. beneath the surface of the water in the cistern or hot well below. The weight of the constantly descending column maintains the vacuum on the engine. Suitable stop valves are provided, and when not required to condense, the exhaust steam is allowed to escape h an opening in the crown of the apparatus.

ted, 8d. Drawing.]

A.D. 1865, July 22.—N° 1913.

NEWTON, William Edward.—(*A communication from Thomas Shrimton Davis.*)—This invention relates to piston valves for steam and other engines. The valve cylinder, open at each end, is fitted within the steam chest of the engine cylinder; it has openings to correspond with the induction ports and with the exhaust. The valve rod enters the steam chest through a stuffing box, and carries two piston valves, between which the exhaust steam flows from the cylinder. The steam presses convergently upon the outside of each valve, so that the pressure on the area of one is counterbalanced by the pressure on the other, and a uniform expansion of the parts is caused by the surrounding steam. The primary object of the invention consists in so packing the peripheries of the valves, that unavoidable wear is compensated, a good fit secured, and leakage prevented. This result is obtained by forming each piston or valve of a series of concentric expansible metallic rings, so arranged upon a central cone-formed block, that by means of a screw nut upon the spindle, the adjustment of the rings, which are split and arranged to break joint, is easily effected.

[Printed, 10d. Drawing.]

A.D. 1865, July 22.—N° 1915.

BOULTON, Matthew Piers Watt.—This invention relates to " obtaining motive power when heated air or aeriform fluid is " employed " and consists,

1st. In " the modes described of heating aeriform fluid under " pressure for the production of motive power."

2nd. " The injection of an inflammable aeriform mixture at " high pressure, or at a pressure exceeding that of the atmosphere, " into a cylinder in which it is ignited, the resulting products of " combustion acting on a piston in the cylinder and producing " motive power."

3rd. Particular methods described in reference to this mode of using products of combustion alone or mixed with steam, for obtaining motive power.

4th. " Employing a stream of liquid set in motion by a blast of " steam or heated aeriform fluid to work a turbine or instru- " ment."

5th. “Treating a current of liquid when it is desired to reduce “ its velocity for the purpose of changing its energy or a portion “ of its energy from the form of vis viva into that of pressure or “ potential energy, so as to cause it to enter a vessel against pres- “ sure.” The current of water is caused to pass through an expanding passage similar to the “Giffard” injector, whereby it loses a portion of its vis viva, and acquires an amount of working energy in the form of pressure, necessary to actuate the engine or instrument employed to give off power.

[Printed, 1*s*. Drawing.]

A.D. 1865, July 25.—N° 1928.

ZBYSZEWSKI, Wladislaus.—(*Partly a communication from Alexandre Szpis.*) — (*Provisional protection not allowed.*) —This invention relates to the use of petroleum or other mineral oil, as liquid fuel, for the purpose of generating steam and heat. When employed in boiler furnaces, a sufficient quantity of incombustible medium, capable of absorbing the inflammable fluid, such as brick, pumice stone, asbestos, or other porous material, sufficient to form the fire-bed, is, after being saturated with the fluid, deposited in the furnace, and upon a flame being applied thereto the whole mass will ignite. When the fluid is partly consumed, by means of a pump, worked by hand or power, a fresh supply is, through pipes with suitable nozzles, forced in fine jets, more or less continuously, into the furnace over the burning mass. Atmospheric air to support combustion is to be supplied by means of a blowing apparatus, and introduced through jet pipes suitably arranged in the furnace. The oils employed are to be freed from their volatile elements, in order to avoid sudden ignition or explosion.

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 25.—N° 1929.

JUCKES, John, junior, and SWINBURNE, John.—“This “ invention relates to the adaptation of an endless chain or system “ of revolving-fire-bars to the furnaces of locomotive boilers.”

“The endless chain of bars is supported and carried by barrels, “ one at each end. The barrel which carries the endless chain at end is cogged or formed with a surface suitable for driving ain when the roller is rotated. The axis of this barrel bearings on the sides of furnace or frames, and such axle

" has fixed on it a ratchet wheel, which receives motion by a con-
" necting rod and driver actuated by an excentric on one of the
" axles of the locomotive engine. The axis of the other barrel,
" which is under the fire-box or furnace of the locomotive engine,
" turns in bearings carried by a frame, one end of which frame is
" supported by necks or axes in such manner that the other end
" of the furnace is capable of being lowered so as to discharge the
" fuel from the fire-bars. The further end of the frame has
" plates fixed or formed on it, which are slotted, and through the
" slots a cranked axle passes, and there are also outside plates
" supporting the bearings of the cranked axle. . . . . . One
" of the barrels is capable of being adjusted away from the other,
" in order to compensate for the wear of the chains. At the fire-
" door end of the furnace or fire-box there is a hopper having at
" its bottom a sliding door, by which the quantity of fuel taken
" on to the fire-bars is regulated. Within the furnace or fire-box,
" near the door, there is an arch of fire-brick. At the other end
" of the furnace is a water pipe, through which water is circulated,
" and over this a bridge of fire-clay. When at work the endless
" chain of fire-bars is raised to the highest position, or somewhat
" below it, as occasion may require, in order to regulate its posi-
" tion in respect to the water pipe above. When the furnace is
" divided more than one endless chain of fire-bars is employed."

[Printed, 10*d.* Drawing.]

A.D. 1865, July 26.—N° 1938.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from Patrick Hayes.*)—(*Provisional protection only.*)—This invention relates to apparatus for burning inflammable and volatile liquids, for generating steam and other purposes.

Mineral oil, such as petroleum in its crude state, or any description of cheap oil, coal tar, or pitch, "is taken and placed in a tank
" or cistern in a convenient position near the furnace, and at such
" a level as that they may be introduced into a reservoir to be
" placed in the furnace or fire hole where the heat is required by
" means of a pipe and stop cock. This reservoir may be made of
" any required size, and is partly filled with coke or broken stone
" or any other suitable material for the purpose of giving a larger
" surface for the oil to act upon, and consequently to throw off a
" greater quantity of fumes; it is also partly covered at the top,

" leaving only sufficient space for the flame to come forth either " in jets through perforations, or through one large slot. Inside " this reservoir, and between the level of the material therein and " the top thereof, a perforated pipe is fitted for the purpose of " conducting a sufficient stream of atmospheric air, or steam, or " hydrogen gas, to be supplied from any suitable source, for the " purpose of mixing with the fumes of vapour of the oil, which " can be heated by any convenient method. The vapour can " then be lighted at the perforations or opening in the top of the " reservoir. A continuous stream of atmospheric air, steam, or " hydrogen gas must be constantly passed into the reservoir " through the aforesaid perforated pipe, which may be formed of " copper, iron, or fire clay. The reservoir will become gradually " heated, and the fumes of vapour of the oil will gradually " increase, and burn in a pure white flame without any smoke " whatever, but giving out an intense heat, which will generate " steam much quicker than coals, and at a cheaper rate. By " means of the stop-cock before referred to the supply can be cut " off, and consequently the flame stopped whenever required."

[Printed, 4d. No Drawings.]

A.D. 1865, July 27.—N° 1952.

SHERWOOD, Henry. —(*Provisional protection only.*)—This invention relates to the treatment of fibrous substances, and rags composed of animal and vegetable fibres, in order to remove the vegetable fibres by disintegrating them without injury to the animal fibres, and to prepare the animal substances for re-use in textile manufactures; also for recovering the vegetable fibres for subsequent use as paper pulp. For these purposes sulphuric and other anhydrides in a gaseous state are employed; also anhydous gases of the hydracids, such as anhydrous hydrochloric acid gas, diluted with carbonic oxide and other gases of a deoxidizing nature.

One of the means employed to produce a portion of the gases is a smokeless furnace, which burns with a downward draught, taking the air from a pipe above, and, when desired, steam from water dropped upon the surface of the burning fuel. Amongst
s to which this furnace may be applied, is its adaptation
ive, marine, and stationary steam boilers, the gases
brought into combination with air previously

heated whilst passing through chambers at the sides of the furnace. The combustion may take place at the back of the furnace, and produce one body of flame, or the volume of gas may be divided, and conveyed to different parts of the boiler, and there combined with the heated air and burnt, producing separate volumes of flame, thereby preventing the formation of smoke, and deposition of carbon in the boiler tubes. Fuel of the lowest quality may be indiscriminately used.

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 28.—N° 1956.

NEWTON, William Edward.—(*A communication from John Wesley Carhart.*)—This invention relates to such conical plug valves as work, with oscillating motion, in sockets of corresponding form; the object being, so to arrange the valve, that it will be balanced under any pressure of steam, and kept in its seat thereby while working freely and perfectly steam tight. It consists "in the application of a bearing surface below or opposite to " the abutment. Also, for the same purpose, the use of a lip " extending from the small end of the conical valve; also the use " of a recess in the large end of the conical valve, to which steam " is admitted through suitable channels; further, in forming a " recess or recesses in the socket above the valve, or on the " exhaust side of the abutment, so that the valve may swing " beyond the edge or edges thereof, and thereby prevent it from " wearing into the form of a shoulder; also in thinning the valve " at the exhaust side, or thickening it at the steam space side for " the purpose of giving lead to the exhaust; finally, in forming a " chamber in the large end of the valve for the purpose of keeping " the valve in its seat by the pressure of steam admitted to the " chamber."

[Printed, 8*d*. Drawing.]

A.D. 1865, July 28.—N° 1958.

NEWTON, William Edward.—(*A communication from Henry Isham.*)—This invention relates to a water meter, which may be employed as a water, gas, or steam engine.

It "consists of a group of any number of cylinders (four by " preference), each provided with a piston, and arranged round " a central axis of rotation. These cylinders are open at their

" lower ends, and in their revolution round their axes they pass " in succession over an induction way to receive the water or " other fluid which actuates and raises the pistons in the cylin" ders. The cylinders then pass over an eduction way, through " which the water or other fluid is discharged, and the pistons " descend. The pistons are connected by rods with a plate " mounted on a hub on the arms of a hub which turns on " an axis placed at an angle with the axis of the group of " cylinders."

"When water or other fluid under pressure passes from the " induction pipe into any one of the cylinders it acts against and " forces the piston of that cylinder upwards, and this action, by " reason of the inclination of the axis of the plate, causes the " cluster of cylinders, with their appendages, to rotate about " their common axis, and that cylinder which is on the opposite " side of the axis is thereby caused to pass over the eduction " way, into which the water or other fluid is discharged by the " downward motion of its piston. Before the eduction pipe is " opened, the water or other fluid discharged into the eduction " way escapes through the outer portion of the eduction aperture " or port into and fills the case, making a counter pressure on " the upper surface of the piston, thereby producing an equili" brium, and holding the meter or engine in a state of rest; but " the moment the eduction way or pipe is opened for the escape " of water or other fluid the equilibrium is destroyed, and the " meter or engine started and worked in exact proportion to the " capacity of the discharge, the surplus pressure being balanced " by the fluid in the surrounding case. The surrounding case " should be provided with a small cock or valve to permit the " escape of air until it is filled with water or other actuating " fluid."

" When employed as a meter for measuring the flow of water or " other fluids, the hub of the plate should be connected with " suitable registering mechanism, but when used as a motor the " hub is to be provided with a belt, wheel, or other gearing for " transmitting motion."

[Printed, 10*d*. Drawing.]

A.D. 1865, July 31.—N° 1972. (* *)

ROBINSON, Benjamin, and VARLEY, Joseph.—"Appa" *ratus* for promoting the combustion of fuel in furnaces of

" steam boilers, dyer's or brewer's pans, and other furnaces." Each furnace door is double, the inside one being perforated. Both can be hinged, but the plain door may be made to slide to and from the perforated door, which is the first to be closed on the fresh fed fuel, to which the air is thereby admitted until the proper time for closing the plain door. A pipe, connected with the steam chamber, is bent into each of the ash-pits; it is perforated on the upper side, so that by opening a tap jets of steam can be emitted against the furnace bars. A perforated plate forms the back of the hollow fire-bridge. At front is a movable flap, attached to which is a rod, whereby air can be admitted from the ash-pit into the bridge, and thence through its perforated back to the flame bed.

[Printed, 8*d*. Drawing.]

A.D. 1865, July 31.—N° 1975.

RAMSBOTTOM, John.—This invention relates to the "manu-" facture of hoops and tyres." It is supplementary to Letters Patent, bearing date 7th January 1864, No. 48, wherein this inventor describes a mode of cutting ingots of metal into discs by means of circular saws. In order to save that portion of the metal which is removed by the saw, the inventor, according to the present invention by means of suitable apparatus, detaches or forms the discs from the ingots in a heated state by means of a a circular plate, the edge of which, whilst revolving in contact with the heated ingot, is pressed into its circumferential surface, whereby, according to the number of plates employed, one or more discs may be wholly or partly taken off, and in the latter case the operation finished by a saw. Cold water is applied to the sides of the cutting plate during the operation, the ingot being supported upon two rollers which are actuated by the driving power, and being roughed or corrugated on the surface, they cause the ingot to revolve in the required direction for operating upon it with the cutting plate or plates.

Another part of the invention relates to the punches used for perforating the discs, which according to a former Patent, dated 13th April 1863, No. 924, were described by this inventor as having flat ends. In lieu of such form, he now uses round ended punches, in order that no portion of the metal be removed.

The invention further consists in producing ingots by casting them in the form of a frustum or base of a cone, hemispherically or otherwise shaped, and afterwards flattening them into discs by hammering or compression in the direction of their axes. A rim may be cast on the base to form the flange of the tyre.

Another part consists in the use of a revolving mandrel, which in form is parallel or tapered; or a mandrel with longitudinal grooves, for expanding hoops, instead of with spiral grooves as described by this inventor in the Specification of a prior Patent dated May 5th, 1865, No. 1425. Also in applying pressure rollers to force the hoop on the mandrel.

And lastly, the invention relates to the manufacture of hoops for making the cylindrical sections of steam boilers. These hoops are first made thick from cylindrical ingots. They are then when heated placed upon a mandrel, and pressed upon by rollers at the opposite sides. These rollers and the mandrel, are cross cut on the surface, or diagonally grooved, so as to form diamond shaped projections upon their surface, which when pressed into the heated metal, the more easily cause it to expand both diametrally and laterally. The hoops are kept hot during the process by a current of heated air. Modifications of this part of the invention and further details are illustrated and described.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1865, August 1.—N° 1990.

MARTIN, Louis Emile Constant.—This invention relates to the furnaces of locomotive and other tubular steam boilers, with a view to the perfect combustion of the carbonic oxide which is produced from either rapidly or slowly burnt fuel, and which escapes inflammation, unless the gases passing from the fire be afterwards heated and commingled with atmospheric air. To ensure the complete inflammation of all the gaseous products, within the furnace immediately in front of the tube plate, is mounted a block of fire-brick or other suitable material, having numerous holes or passages through it, corresponding with the openings to the tubes. The fire-bars are so inclined, that the incandescent portion of the burning fuel accumulates at the lower end immediately under the fire-brick block, which is thereby exposed to the fiercest heat, and which contains a narrow inner chamber whereinto the atmosphere is admitted. All the openings on the front side of the block lead into this chamber, and continue through the opposite side, whence the burning gases go direct into the tubes. The quantity of air admitted is regulated by a valve, and a flap valve is provided for the removal of the cinerary particles which fall between the block and the tube sheet.

[Printed, 10*d*. Drawing.]

A.D. 1865, August 1.—N° 1992.

BOULTON, Matthew Piers Watt.—This invention relating to "obtaining motive power by heat," consists in utilizing the heat which passes off with the products of combustion from engines worked by the ignition of inflammable fluid. After having been ignited in the cylinder employed for the purpose, the products of combustion are caused to traverse narrow passages, lined or furnished with surfaces wetted by injecting water thereon. Wire gauze surfaces may be used for the purpose. Heating the water on these surfaces, steam is generated, and employed in co-operation with the heated gases, in driving the piston. Various arrangements are described. The surfaces may be movable with reciprocating or rotary motion, and may, in conjunction with the strokes of the piston, be caused to dip into a vessel containing water. Two working pistons of different diameters are employed in conjoined cylinders, which may be made either single or double acting, the heating surfaces being disposed in the passages or interspaces. The ignition of the gases may be effected by the electric spark from a voltaic battery or otherwise.

A portion of the heat employed to produce motive power may be made to generate electricity, by applying it to certain metals composing a thermo-electric pile battery, whence electro-motive force may be obtained, whilst the portion of heat not so converted may be employed to generate steam in an engine boiler, to work a steam engine, or to heat aeriform fluid, to work a caloric engine.

[Printed, 10*d*. Drawing.]

A.D. 1865, August 2.—N° 1996.

McEWAN, James, and NEILSON, William.—This invention relates to apparatus and means employed for raising, drawing, and forcing liquids through open pipes without the use of ordinary pumping appliances, this object being attained by applying, by means of the apparatus, to the column of water at intervals of about 15 feet, the impulsive force of annular jets of high-pressure steam, so as to act at an acute angle upon the water in the direction of the up-flow.

The apparatus or "steam liquid raiser" consists of a short length of flanged pipe corresponding in size with the column, having an enlargement about its mid-length which forms a spherical chamber, whereinto the steam is admitted through a lateral branch. The lower end of the pipe is bored out to receive a tube of the same size internally as the upper end of the pipe. The upper end of the tube is so bevelled as to form in appearance the base of a cone. The tube forms a continuation of the column by passing up centrally through the chamber, entering a short distance within the upper end of the pipe, which is so opened out that a thin annular conical space is formed round the end of the tube, between it and the entrance to the pipe from the top of the chamber. These flanged sections of chamber pipes are interposed at regular intervals in the column of pipes. The amount of vacuum formed in the lower part of the column by the upward rush of steam, causes the water to ascend to "the first " 'lifter,' where the steam meeting the compact column of water, " forces it some distance higher than itself and brings it within " the power of the second 'lifter,' which raises it in a similar " manner for the next stage within the power of the third 'lifter,' " and so on until the water flows off at the top of the pipes, or " the height and level required for its delivery."

The invention may be modified by breaking the column into sections, and employing a series of cisterns, one to each "lifter" wherein it will deliver its draught of fluid to be taken up by the next lifter above, and so on in succession until the desired height is attained.

[Printed, 1*s*. Drawing.]

A.D. 1865, August 4.—N° 2021.

CLARK, William.—(*A communication from Francis Bernard de Keravenan.*)—This invention relates to apparatus applicable as a motive-power engine, to be worked by steam or otherwise; it *is also applicable* as a pump, or a fluid meter.

It consists of an outer fixed cylindrical case closed at each end by covers, through the centre of which is passed a central shaft or axis. Mounted upon the shaft, within the cylinder, there is a closed piston drum. This drum is eccentrically fixed upon the shaft, so that when revolving, its major radius is always in frictional contact with the internal surface of the outer cylindrical case, between which and the eccentric piston drum, there is a crescent formed space constantly moving round the central axis. Formed in a diametral line with each other, at opposite sides of the case, there are two deep recesses, wherein are fitted two slides, which work radially to and forth across the internal space, their inner ends being kept in constant sliding contact with the surface of the eccentric piston drum, by means of external side rods, and cross heads fitted upon rods attached to the outer ends of the slides. One of the slides acts as the steam valve, and admits the steam into the crescent formed space through a passage at one side, the exhaust passage opening out of the space, through the case on the other side or back of the valve slide, which also constantly acts as a steam resistant, whilst the force of the steam pressure in the opposite direction, compels the rotation of the eccentric drum and shaft. The opposite slide is narrow and does not divide the space, but when forced outward by the eccentricity of the drum, by means of the outside connecting rods, it effects the return or inward movement of the steam slide, which in turn is forced outwards by the surface of the drum, and effects the return movement of the opposite slide. A self-adjusting packing piece is hinged to the inner end of each slide, working in constant sliding contact with the periphery of the eccentric drum.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1865, August 7.—N° 2043.

FOUBERT, Adrienne Anastasie.—This invention relates to apparatus for regulating the flow of steam, water, and other fluids under pressure. It consists of an outer tubular casing, and an inner or valve tube, the lower end of which is attached to a piston which fits to the interior of the casing. The steam or fluid enters at the upper end of the case, and passes out at an aperture at the side. The piston, sustained at the proper height in the case by a spiral spring beneath it, is acted upon by the pressure, which causes its descent and the compression of the spring, at the same time that the inner valve tube is drawn down, and more or less closes the aperture. The upper end of a rod is attached to the underside of the piston, and the lower end is fixed in a regulating screw, which fits up through a threaded hole in the bottom of the case, and an extension of the rod below the screw indicates on a graduated scale, the different degrees of pressure upon the piston, in relation to which the flow of the fluid is regulated.

[Printed, 1*s*. Drawings.]

A.D. 1865, August 7.—N° 2051.

BOULTON, Matthew Piers Watt.—This invention has for its object improvements in generating steam, and in superheating steam and aeriform fluids. "Steam passing from a boiler is " superheated, and the superheated steam is caused to pass " through the water in the boiler, such a force being applied to it " by means of a propeller or forcing apparatus as is requisite to " force it through the water. The heated steam rising through " the water generates steam." Various other plans for the practical operation of the invention are resorted to and described; that which is represented by the drawing, consists of a vessel or generator, containing water or liquid heated by the products of combustion conveyed under pressure through pipes from a furnace, and discharged low down within the vessel, beneath the body of the water. The superheating vessel is suspended within the generator by a tubular connection, which serves as a steam-tight entrance for a rod with to-and-forth vertical action. Within the superheating vessel the lower end of this rod is attached to a horizontal frame or plate, descending from the underside of which are vertical heating rods, which pass down through well fitting openings in the bottom of the superheater into the boiling water or liquid beneath. The vertical action of the heating rods is continuous; descending into the boiling liquid, they absorb heat therefrom, and diffuse it amongst the steam when, by the return action, they are raised into the superheater, which is partly immersed in the boiling water. Various kinds of heating surfaces are cleansed from incrusted matter.

[Printed, 6*d*. Drawing.]

A.D. 1865, August 9.—N° 2062.

CARTWRIGHT, Henry.—This invention relates to direct-acting *marine* and stationary steam engines, and consists, in so arranging the parts which transmit motion from the piston rod to the crank shaft, that the height of the engine is reduced, and room afforded for a longer stroke. A pair of engines with upright cylinders are illustrated and described. The cylinders are disposed on a bed plate beneath a top frame, which is supported on columns. The top of the piston rod of each cylinder carries a horizontal cross beam, the ends of which are fixed to vertical side guide rods, which pass down at the side through the top flange of the cylinder and cover, and are attached to blocks which slide in vertical guides attached to the cylinder sides. The lower ends of the connecting rods are jointed to these sliding blocks; the upper ends are coupled to a stay rod, carried by crank arms fixed on the ends of intermediate shafts rectilineally disposed on the top framing in suitable plummer block bearings. These shafts carry toothed wheels, which gear into similar wheels fixed on a counter-shaft which extends beyond the whole length of the frame, whereby the reciprocations of the pistons, one of which follows the other at an interval of 90°, are timely maintained. The modification of an engine with side levers is shown, and an arrangement of the invention as applied to screw propulsion.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1865, August 9.—N° 2069.

LONGSTAFF, James William.—(*Provisional protection only.*) —This invention relates to the prevention of steam pressure on the back of steam engine slide valves, which are arranged to work between the cylinder port facing and an adjustable block, conveniently let into the steam chest through an opening in the cover, made steam tight by suitable packing disposed in recesses formed to receive it. The block is held in close contact with the valve by means of screw nuts and studs, which project through cross bars fixed to the steam chest cover. The block is cast with an open passage for the free circulation of the steam from end to end of the chest. T-shaped recesses are cast in the valve to receive the end of the valve rod, which is shaped to correspond.

[Printed, 4*d*. No Drawings.]

A.D. 1865, August 11.—N° 2080.

COLE, William Thomas, SWIFT, Henry Spink, and SOARES, Augusto.—This invention relates to obtaining and applying motive power, to act either alone by steam taken direct from a boiler, or in conjunction with an ordinary steam engine cylinder by means of the exhaust steam. The apparatus consists of (in appearance) an ordinary fly wheel which is mounted on a hollow axis. The arms of the wheel are tubular, and form radiating steam passages from the lateral apertures in the hollow axis to the rim, all opening out in one direction through the periphery at right angles to the radius. Throttle valves are employed to regulate the flow of steam through the radiating passages, which at their extreme ends are contracted, in order that the outflow may issue from the periphery at the full boiler pressure. When the impulsive force of the steam meets with the resistance of the atmosphere, the pressure partly reacts upon the wheel, which is thereby pressed back and caused to rotate in the direction contrary to that of the steam issue. Arrangements are described for the practical application of the principle of the invention to general purposes.

[Printed, 8*d*. Drawing.]

A.D. 1865, August 14.—N° 2096.

WESTLEY, Robert Alexander William.—(*A communication from Henry Pinkus.*)—This invention relates to the "method, " apparatus, and receptacles for storing, preserving, transferring, " and discharging certain fluids for sanitary and protective pur- " poses," and also amongst other uses, the adaptation of the invention to steam boilers, for the purpose of discharging with safety the inflammable material or compound into the furnaces of such steam boilers, which fluid is consumed therein as liquid fuel for the purpose of generating steam, to and with which fuel, it is indispensable that regulated quantities of elements imparting oxygen be admitted and caused to combine at the moment of ignition, in order to prevent the emission of smoke and the formation of soot; also, to avoid waste and to make sure that the inflammable fuel is with economy and better protection, applied to marine, stationary, and locomotive steam boilers.

When the storing receptacles are arranged hydrostatically on ship board, all the tanks, outlets, and transferring tubes should unite with a common main pipe, leading at a suitable level into the boiler room, where slide valves are interposed to shut off and admit the supply to the lower part of a fixed wrought-iron screen tank, divided horizontally by a series of iron frames, which hold wire gauze partitions, severally above and beneath which sheets of common felt are disposed in layers, wherethrough the petroleum or liquid fuel is caused to percolate by the hydrostatic pressure. By these means all danger of explosion is avoided. The tube furnished with a regulating cock which supplies the furnace, communicates with the upper part of the screen tank. The furnaces closed by doors, are of ordinary construction, omitting the grate bars. The inflammable fuel is ejected into the furnace through slotted openings from one channel of a duplex discharging apparatus, and the oxygenous elements, such as heated air and superheated waste steam, are so admitted through other channels in the apparatus, as to commingle with the gases evolved by ignition.

The parts are modified to suit applications of the invention to different kinds of boilers.

[Printed, 2s. 8d. Drawings.]

A.D. 1865, August 15.—N° 2106.

JOHNSON, John Henry.—(*A communication from François Drivet.*)—(*Provisional protection only.*)—This invention relates to the production of metals in a spongy or porous state, and to applying such metals to various purposes, amongst the most important of which are electric batteries and the lining of steam generators. In preparing spongy or porous copper, a solution of sulphate of copper, saturated with five or six times its volume of water acidulated with one-third of its own weight of sulphuric acid, is precipitated in the amorphus state upon the plate which is to receive the spongy metal, by means of a galvanic current produced by either a simple or compound apparatus, viz., with a diaphragm or by a battery, using at the same time a platinum ring in the bath. For the space of an hour after the solution is reduced, the galvanic current is allowed to continue, and during this time the effect of the disengagement of the hydrogen causes the porous or spongy state of the metal to be produced. The current is then interrupted in order to add to the liquid more sulphate of copper, which, in a crystalline state, is suspended in a small bag inside the vessel, care being taken not to agitate the vessel or its contents, in order that the metal may acquire all the porosity possible.

[Printed, 4d. No Drawings.]

A.D. 1865, August 18.—N° 2130.

STEVENSON, JAMES.—(*A communication from Giovanni Batista Venzano.*)—This invention relates to a rotatory steam engine, whence "rotary motion is at once obtained by the direct impact " and continued pressure of steam upon the periphery of a cylin- " der or wheel" suitably furnished to receive it. Two wheels on the same axis side by side, or a double wheel is employed, the buckets or cells on one side or section being arranged at suitable angles for forward motion when struck with the impulsive force of the steam, and those on the other section for the reverse. On the periphery of each wheel or section a steam-tight chest is placed, so as to be in steam-tight frictional contact and cover a certain number of the buckets as the wheel revolves; grooves are formed round the wheel into which suitable metallic packings attached to the steam chest are fitted to slide. After the steam has operated it is, by preference, in some cases, directed into converging tubes, which form a connection between the buckets at the periphery and the axis of the wheel, which is hollow and forms a passage for the steam to the pipe which leads to the condenser or to the atmosphere. The drawing exhibits the invention applied as a marine engine for driving a screw propeller by means of the intervention of a large spur wheel mounted on the main axis, and geared into a pinion which is fixed upon the propeller shaft.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1865, August 22.—N° 2158.

LOCKWOOD, JOHN.—This invention relates to the construction and arrangement of the fire-bars of steam boiler and other furnaces. The sides of each fire-bar are furnished with projecting pieces which are cast with the bar, the interspaces between these lateral projections forming passages for the upward currents of air from the ash-pit. The ends of the bars are pivoted and rest in holes formed at intervals corresponding with the breadth of the bar, in the back and front transverse bearers of the furnace grate frame. A short lever arm is fixed on the front end of each bar, and the free ends of these arms are jointed to a link rod which is horizontally disposed across the front of the ash-pit beneath the dead plate. By means of a bell-cranked handle, when moved by the attendant, a horizontal to-and-fro motion is imparted to the link rod, and by means of the lever arms on their front ends, the bars are simultaneously set in motion, rocking more or less according to the length of movement which the handle receives. By these means the formation of clinkers is prevented, the spent fuel is removed from above the bars, and a free and increased admission of air to the burning fuel is encouraged.

[Printed, 8d. Drawing.]

A.D. 1865, August 24.—N° 2174.

DAVIES, David.—The object of this invention, which relates to steam hammers, is to make such hammers capable of delivering blows with various lengths of stroke, and varying degrees of force, at an angle with the face of the anvil, as well as perpendicularly. The steam cylinder which works the hammer is fixed at right angles within a horizontal cylinder, which is capable of being turned on its axis in suitable bearings, and thus carry the steam cylinder and hammer. This motion of the horizontal cylinder is effected by means of levers or other contrivances under the control of the workman, who is thereby enabled to direct the blows of the hammer upon the metal under operation at any desired angle. The steam chest is placed at right angles to the axis of the steam cylinder, and fitted with an ordinary cylindrical equilibrium valve, worked by an internal link or excentric cam, which is actuated by a stud projecting from the piston rod, the link being fitted with a sliding plate at each end for the purpose of regulating the length of the stroke and force of the blow. Instead of steam, the hammer may be worked by water or compressed air. When the hammer is worked by an arm, its relative position with the horizontal cylinder may be changed, and arrangements are provided for mounting the latter on a horizontal bed plate, capable of moving on a centre, so that it may, by changing the position, have the power to operate upon a number of anvils circumposed around. The steam pipe is made telescopic to conform to changes in the working position of the hammer, and a regulating valve is introduced contiguous to the position of the workman, who is enabled to operate upon it with his foot.

[Printed, 2s. 2d. Drawings.]

A.D. 1865, August 25.—N° 2189.

NEWTON, William Edward.—(*A communication from Henry Clark Sergeant.*)—(*Provisional protection only.*)—This invention, relating to steam boilers or generators, has for its object the rapid generation of steam with a minimum consumption of fuel. This result is effected by so disposing a metal plate or plates inside the boiler, a short distance from those surfaces which are subjected to the direct action of the fire, that only a thin space is left between; through this space, which is thereby separated from the great body of water, the latter freely circulates, and is directly subjected to the action of the furnace heat, whereby steam is rapidly generated in the space, which steam passes therefrom to the upper part or steam space of the boiler. The passage of the steam is thereby confined to the furnace surface, which tends to superheat it, a strong circulating current of water being kept up within the space, and other steam being generated by the steam thus superheated in the thin space as it passes up through the body of the water. When the invention is applied to a vertical boiler, the furnace and fire-tubes are surrounded with casing, so that the greatest heat of the fire acts upon the water circulating therein and coursing upward towards the steam space, wherein a horizontal plate is disposed to intercept sedimentary particles which are being thrown up by the ebullient water and deposited thereon, whence the accumulation may be removed when desired.

[Printed, *4d.* No Drawings.]

A.D. 1865, August 28.—N° 2202.

GRAHAM, WILLIAM, BROUGHTON, JOHN, and CORKHILL, THOMAS.—(*Provisional protection only.*)—This invention, relating to a rotary engine, consists "of a cylinder supplied with two or " more ports or thoroughfares for the admission of steam, and " one exhaust pipe or exit for the steam; the admission 'ports' " are so constructed as to cause the steam to enter the cylinder " at right angles to its centre or axis, and the exhaust or exit at " at a point about parallel to the centre. To the centre shaft or " axis of the cylinder a number of curved plates are secured, " extending each like curved radii from the centre shaft towards " the inner surface of the cylinder, and are arranged so as to " exert upon the inner surface of the cylinder a pressure sufficient " to keep each recess or compartment formed by the said plates " steam-tight. The covers or ends of the cylinder are formed of " circular plates secured to the body of the cylinder, supplied with " *stuffing boxes,* through which the central shaft revolves. The

" steam, when entering the ports of the cylinder at right angles " to its axis on the parallel centre thereof is forced against and " fills the concave recesses or compartments formed by the afore- " said curved plates, the action of which gives a powerful rotatory " motion to the central or driving shaft to which they are secured, " and the steam escapes by the exhaust pipe from each compart- " ment as they pass during revolution."

[Printed, 4d. No Drawings.]

A.D. 1865, August 28.—N° 2211.

NEWTON, Alfred Vincent.—(*A communication from Gustav Adolph Riedel.*)—This invention relates to apparatus for supplying boilers with water. It "may be described as a close vessel or " feed water receiver mounted upon an oscillating frame formed " of a bent tube or tubes, the ends of which approach each other " and form hollow journals, which have their bearings in two " valve chests set over the boiler. Pendent from these valve " chests are pipes, one of which leads to the bottom of the boiler, " and the other to the determined water line. The journals of " the pipes carry arms or fingers, which serve to operate the " valves in the valve boxes when the feed-water vessel and its " frame oscillate. This hollow frame is divided by a plug, and it " connects with the top and bottom of the vessel by pipes at " opposite sides of the plug, which pipes severally open a commu- " nication between the vessel and the valve boxes. A third valve " box connects the water supply pipe with one of the valve boxes " of the oscillating frame, and the valve rod of this third valve " box is connected to a weighted rock lever, which is also con- " nected by friction rollers with the pipe leading down from the " feed water vessel or receiver." When the receiver in its lowest position is full of water, and the communication with the feed pipe closed, then by means of the valves the communication with the boiler is open, and the steam is admitted to the receiver. As soon as the water level in the boiler sinks below the datum line, the pressure of the steam upon the surface of the water in the receiver, causes the water to be discharged into the boiler. The weight of the water being removed the receiver rises, whereby it is again put into communication with the feed pipe and filled with water, the weight of which causes it to descend to its normal position, there to await the next discharge into the boiler, caused by the successive automatic movements of the valves and apparatus.

[Printed, 1*s*. Drawings.]

A.D. 1865, August 31.—N° 2245.

BENNETT, Oliver.—(*A communication from John Allen Bassett.*) —This invention of a steam blower or blast apparatus for furnaces, consists of a fan wheel combined with a rotary engine constructed on the reacting principle of the " Barker mill " or " Avery engine," and so arranged that the exhaust steam from the engine shall actuate the fan wheel, and cause a powerful air current which mingles with the steam. The apparatus may be applied to the ash-pit of a furnace, or to an opening leading thereto, the combined current of air and steam being directed under the fuel for the purpose of promoting combustion.

"The engine may be placed either in front or in rear of the fan " wheel, or the wheel may constitute a part of the engine. The " shaft of the fan wheel may be a tube or conduit, and be pro- " vided with a series of curved or bent discharging tubes or " conduits leading laterally from it, and either one or more of " them may run alongside of each fan or vane of the fan wheel. " The fan wheel and the engine may be in a cylindrical case " provided with an air induction opening at or near the centre of " one side of such case; and such case may have a discharging " conduit leading out of its circumference or rim, and opening " into the ash-pit of the furnace when applied thereto."

[Printed, 6*d*. Drawing.]

A.D. 1865, September 1.—N° 2260.

LAKE, John.—This invention relates to multitubular boilers especially applicable for agricultural and other locomotive and marine steam engines; Letters Patent bearing date February 7, 1865, No. 345, having by the inventor been previously obtained for the application of the invention to the stationary boilers of fixed engines. In the smoke chamber opposite the rear end of each tube or flue way, the point of a coniformed fluted plug or valve is disposed in position for entering, for the purpose of holding in check, the heat and the flaming gases, so as to prevent their too rapid passage through the flue tubes. These pointed *plugs are fluted* from the base to the end, so that minute draught ways are always left open; they are fitted to frames which cover sectional areas of the entrances to the tubes, and by means of suitable mechanical arrangements, operated by the attendant, are advanced to the tubes separately, sectionally, or collectively. It is stated that the object of the invention is not new, it having previously been sought to be obtained by the use of dampers and other imperfect contrivances.

[Printed, 10*d.* Drawing.]

A.D. 1865, September 4.—N° 2272.

HOWARD, James, STAFFORD, William, McCALLUM, William Porter.—This invention relates to apparatus for preventing incrustation in steam boilers, heating feed water, consuming smoke, and preventing explosions.

Incrustation is prevented by intercepting and carrying off the scum and particles which rise to the surface of the water when in a state of ebullition. For this pnrpose a long box or vessel, narrowing towards the top and with open grating at the sides, is transversely fixed inside the boiler above the flues; a series of shelves or inclining planes is fixed, one to each grating bar. A vertical perforated partition plate divides the box from end to end, and vertical pipes form communications between each box (when more than one is employed) and a longitudinal pipe, which is disposed along the water space in the bottom of the boiler, and discharges through the mud cock outside. The scum and particles, which lodge upon the inclining shelves, gradually slide down into the boxes, and thence down the vertical pipes into the longitudinal pipe, whence they are periodically discharged through the mud-cock.

The other parts of the invention, which consist of preventing explosions by blowing steam into the furnace, heating feed water by causing it to pass through a pipe disposed in the flues, and consuming smoke by so placing the feed water pipe in the flues as to divide and cause a distribution of the flames, have since the filing of the Provisional Specification been abandoned, by reason of their want of novelty and utility.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1865, September 6.—N° 2284.

SOUTAR, Samuel.—(*A communication from Daniel McDowell.*) —(*Provisional protection only.*)—This invention relates to a mode

" of fixing and unfixing the tubes of steam boilers." The ends of the tubes which enter the smoke box, are enlarged in diameter ⅛ of an inch, and the holes in the smoke box tube plate are made proportionately larger to correspond; the other ends of the tubes, which are fixed in the furnace tube plate, are parallel, and the holes are made of the usual size to receive them. The enlarged ends of the tubes extend in length about 1½ inch, so that the tubes, which when being fixed are entered through the smoke box tube plate, are free until the furnace plate is reached, when they are drifted up by a mandrel in the usual way, and entering the two plates tightly, are set into place by a blow or two from a hammer.

[Printed, *4d.* No Drawings.]

A.D. 1865, September 6.—N° 2286.

CLARK, William.—(*A communication from George Ichabod Washburn.*)—This invention relating to steam engines and valves, " consists of a steam cylinder within which are located two single- " acting pistons, between which and upon the same axis or stem " with the pistons are two discs, which, although traversing the " cylinder steam-tight, perform no office as pistons to receive or " transmit pressure, but serve to separate the space between the " single-acting pistons into three spaces, the middle one being " always open to the steam from the boiler, and the outer ones " being always open to the outer air condenser or place in which " the exhaust steam is utilized or applied. The steam is by the " reciprocating motion of the moving parts alternately admitted " to and exhausted from the effective spaces at the ends of the " cylinders, and this motion and the consequent opening and " closing of certain ports to certain passages may be utilized for " the purposes of a valve, or by connection with the stem on " which the said pistons and discs are placed, or by a prolongation " of the stem as a piston rod any desired connection with " machinery may be made . . . . . . The live steam from the " boiler is admitted to the effective space to which the piston is " advancing so as to overcome the momentum of the moving " parts within the cylinder by opposing their motion, and upon " the return stroke the live steam until the discs have covered " the ports acts effectively upon the pistons." The invention is *considerably* modified, and may be used as an engine, a valve, or a meter for fluids, requiring less than ordinary attention, as the working parts are located within the cylinder. These engines work expansively, may be constructed to act singly, or in pairs with conjoint action or otherwise.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1865, September 6.—N° 2291. (* *)

GREEN, Edward, and GREEN, Edward, the younger.—"Improvements in boilers and furnaces, and in cleansing the " flues thereof."

An upright boiler "is composed of circular rings," at the bottom, around the outside of which are other rings forming an annular space for "the fire-place." The fuel is fed into this space from the top. "A boiler may also be formed of vertical " pipes placed side by side and communicating at top and bottom " with hollow rings." When "used with puddling and reverberatory furnaces the grate may be dispensed with," and the waste heat passes "through an annular space," "round which" the "pipes are arranged."

For marine boilers "horizontal hollow rings" are used "in the " uptake, with connecting elbows between" them. The rings " may form part of the boiler," or "be used for heating the feed " water or steam." For producing a circulation of the water, a chamber is placed at the top of the rings, and the boiler is set at an incline from the grate.

Furnaces are built with a cylindrical revolving grate, placed transversely and at the furnace mouth, over which is a hopper for supplying the fuel. At the back, and with its axis on a lower level than that of the revolving cylindrical grate, "is " fitted" another but smaller "cylindrical grate;" or "an ordinary " grate fixed upon a hinge" is used. "Instead of a transverse " cylindrical grate," "longitudinal cylindrical grates" are sometimes employed "inside the fire-place in the form of barrels," "cast " hollow with perforations for the admission of air, which like " the others may revolve." The "grate bars" are placed "transversely in the fire-place, of a vandyked form, both at the top " and the bottom."

The soot is removed by compressed air, superheated or other steam, "which is forced in minute jets against the sides of the " heating vessels." "A steam cylinder with a piston," "to the

" end of which is attached an air ram working into a barrel," " is in communication with an accumulator or air vessel." In some cases there may be adapted, "a frame made of a number of " hollow perforated rings encircling the pipe attached to cross " connecting pipes, to which is attached an upright pipe, to the top " of which is fixed a piston working in a cylinder. When the " compressed air is turned on to the cylinder, the framework of " perforated rings is raised on to the top of the apparatus, at the " same time the air is admitted through the opening into the " upright pipe communicating with all the others."

The tubes are cleaned by means of " a central air pipe placed " in each tube."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, September 11.—N° 2321.

TYNE, William, TYNE, Stephen, and CLAYTON, Robert. —(*Provisional protection only.*)—This invention relates to " removing and preventing the incrustation of steam boilers," which is effected partly by the expansion and contraction of the boiler, and partly by the action of steam. " When a boiler is " foul or requires cleaning the water and any loose impurities are " blown off in the ordinary manner; steam or condensed water " is then admitted and allowed to remain in the boiler six or " eight days according to the size of the boiler. When steam " alone is admitted it imparts the requisite heat to the boiler, " and the condensed steam gradually fills the boiler if the steam " be admitted for a sufficient length of time; but when con- " densed water is used it must be heated from the adjacent boiler " or otherwise. The boiler is then started as usual with the " condensed water in it, and the requisite supply of water is added " as the evaporation takes place. When the boiler again requires " cleaning the water is blown off as before, and the scale or " incrustation which had been loosened by the previous operation " will then be found at the bottom of the boiler, and may be " removed in the ordinary manner."

[Printed, 4*d*. No Drawings.]

A.D. 1865, September 11.—N° 2322.

HEWITT, William.—This invention relates to a " composition " for preventing incrustation in steam boilers," and consists in *combining for* the purpose, tannic acid with leather or other unctuous animal matter. Leather or such like material, having passed through the process of tanning, is by boiling reduced to a pasty consistence, and then moulded into blocks. 1 cwt. of leather cuttings to 16 gallons of water will require 5 or 6 hours boiling. Wooden moulds or boxes are used, into which it is removed by a shovel in a heated state, and there left to cool and solidify. The liquor remaining, to which fresh water may be added to make up the requisite quantity, is to be used for the next boiling. To reduce the solid block to a jelly, it is cut into thin slices and dissolved by reboiling in the water, to which is added 1 lb. of common washing soda, and 1 lb. of ammonia, the mass during the process, to prevent its rising over the vessel must be kept stirred. After being allowed to settle, it is poured into casks, and when cool is of the nature of size, and fit for use. The composition may be introduced into the steam boiler, either in the solid block or in the jelly state, at the rate of 1 lb. of composition to every nominal horse-power of the boiler, which proportionate quantity will last about six weeks.

[Printed, 4*d*. No Drawings.]

A.D. 1865, September 11.—N° 2323.

HACKETT, HENRY, WRIGLEY, THOMAS, and PEARSON, EDMUND.—(*Provisional protection only*).—This invention, relating to safety valves, is designed to prevent boiler explosions, and when the water in the boiler is low, prevent any sudden increase of pressure by reducing the heat of the furnace. It consists in securing to the top of the boiler, a cylinder or tube, supplied with a valve or plug, which is weighted to the maximum pressure. A down pipe leads from the bottom of the vessel through the boiler steam space to some distance below the water level, where it terminates with a bell mouth. The steam pressure upon the surface of the water in the boiler, causes the water to rise, and keeps the pipe and cylinder constantly filled with water. When the pressure is superior to the weight upon the valve, and the latter is raised thereby, the water escapes through a down pipe which terminates in the furnace in a suitable position for directing the water upon the fire, which is thereby damped or extinguished. The valve is furnished with a cock which is used for the purpose of ascertaining from time to time the working condition of the apparatus.

[Printed, 4*d*. No Drawings.]

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A.D. 1865, September 13.—N° 2344.

WOODBURY, Joseph Page.—This invention relates to "a "locomotive car," to be actuated by steam on street or other railways, the object sought to be obtained being, facility for running with ease and freedom round the shortest street curves, or other railway tracks. For this purpose, the foundation frame of the body of the car is mounted at the fore and after ends upon bogie or truck frames, each frame with two pairs of wheels, which are fixed upon their axles. The after truck frame is attached to the cross frame of the car by a central vertical bolt, whereby, after the manner of an ordinary fore carriage frame whilst supporting the end of a car, it has liberty to swivel. The fore truck frame carries the boiler and a pair of oscillating engine cylinders, which drive the crank axle of one pair of wheels direct, and these in order to increase the tractive power, are coupled to the other pair of wheels by outside rods and crank pins in the usual manner. This truck is united to the car by a central vertical bolt passing through a strong metal bracket piece, which is firmly fixed to the bottom frame of the car, and projects forward beyond the centre of the truck bolt. The end of the car is supported on an annular bed, which is concentrically fixed on the top of the truck frame, and carries a circumposed series of anti-friction rollers, whereon the under fore frame of the car rests. In some cases the boiler is placed on the centre of the truck frame, so that the chimney funnel passing through the roof of the car is made to answer for an upper centre, whilst the engines and machinery being secured to the truck, are not in any way effected by the motions of the car, the fore end of which constitutes the walls of the engine room.

Modifications of the arrangements and details are fully described and illustrated.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1865, September 13.—N° 2346.

SOUTAR, Samuel.—(*A communication from Daniel McDowell.*) —(*Provisional protection only.*)—This invention relates to apparatus for cleaning the tubes of steam boilers by the force of a jet of steam or other elastic fluid. A jet pipe, with a steam cock next the hand end, constitutes the apparatus. It is about three feet in length, and similar to the hose pipe used with fire engines.

To a steam cock, fixed at any convenient part of the steam space of the boiler, it is connected by a few feet of gas piping, provided with union joints for the convenience of changing its position. The mode of using it, consists in introducing the jet end of the pipe into the tube. The steam cock being open, by a sudden turn of the handle of the jet cock, a blast of steam is in succession sent through the tubes, which has the effect of blowing out at the opposite ends of the tubes, every particle of dirt and crust deposited therein.

[Printed, 4*d*. No Drawings.]

A.D. 1865, September 14.—N° 2352.

BEAMISH, Isaac.—This invention relates to lubricating apparatus, designed to supply the requisite quantity only, so as to avoid wasting the lubricating material. In lubricating engines, the lubricant is caused to commingle with the ingoing steam or heated fluid in fine particles, in which state it is distributed over the heated surfaces.

The apparatus consists of a glass or other cylinder, which by means of rings of vulcanized india-rubber, is set steam and water tight into grooves formed round the brass or metal parts which constitute the top and bottom of the cylinder or vessel. A small quantity of water is first introduced into the vessel, which is then filled with the lubricant or oil. A limited quantity of steam being admitted, causes pressure and outflow, whilst the water of condensation accumulating therein, keeps the lubricant (which swims on its surface) up to the level of the discharge pipe, which reaches (inside the vessel) from the bottom to within a short distance of the top, where the size of the outflowing orifice is regulated by the conically pointed end of a spindle, which by means of a hand wheel is screwed downward through the top of the vessel.

The apparatus is made self-acting by suitable valves and pipes.

[Printed, 8*d*. Drawing.]

A.D. 1865, September 18.—N° 2376.

DAINA, Francesco.—This invention relates to a mode and apparatus for condensing the steam from steam engines, which consists in injecting the steam into water, as it flows through the upper part of a syphon pipe in the direction of the water flow, which must be sufficiently copious to ensure the condensation of the steam. The water current must be rapid, in order that air bubbles may be carried off. The apparatus consists of two pipes, one concentric within the other; the lower ends of these pipes are of unequal length, the outer one terminates below the surface of the water in an upper reservoir, but the inner pipe passes through the bottom, and descends into a lower reservoir, terminating below the level of the water therein. Superposed upon the upper ends of the pipes, there is an air-tight chamber, the lower end of which is contracted to enter the top of the inner tube. The chamber is in communication with the exhaust pipe from the engine. Air pipes are provided for the expulsion of air. Steam is admitted to the chamber, and becoming condensed, a vacuum is formed therein which raises the water, and sets the syphon in operation, in conjunction with the jet of steam from the chamber, which is directed into the current of water flowing down the central pipe, whereby the steam is condensed, and any air which it may contain is carried down into the lower reservoir. Instead of the vacuum being obtained by the condensation of the steam admitted to the vessel, it may be produced by a suitable pump.

[Printed, 8*d*. Drawing.]

A.D. 1865, September 19.—N° 2382. (* *)

WORSSAM, CHARLES. — (*Provisional protection only.*) — " Im-" provements in the means of and apparatus for consuming " smoke in furnaces." " In front of the furnace over the fire " is a tube on the end of which is fixed a " fan-shaped casting;" and a steam pipe from the boiler is jointed to the tube outside the furnace. Fitted to this pipe is a cock with a weighted lever and " a vertical sliding bar," on the lower end of which is " an " incline." On opening the fire-door, " it passes under the " incline," " lifts the sliding bar," " opens the cock," and causes the steam to pass into the mouth of the tube, producing a current of mingled air and steam through the fan-shaped casting " over " the fire."

[Printed, 4*d*. No Drawings.]

A.D. 1865, September 21.—N° 2403.

HULME, JOHN BOSTOCK.—This invention relates to portable *steam machinery,* constructed for excavating, forming and levelling for railways, roads, and other similar works. The cutting tool or shovel is attached to lever arms fixed upon a transverse rocking shaft, which is mounted in the rear of the after cross frame, and obtains motion from a pair of engine steam cylinders, horizontally disposed on a long rectangular frame at the opposite sides respectively of a vertical boiler, placed midway on the frame, between the fore and after wheels, which are made with very broad peripheries or tires for the purpose of travelling on unmade ground. The hind wheels are actuated by the engine gearing, and advance the machine each successive cut of the tool, the operating action of which can be adjusted. The fore axle is attached to a fore carriage which acts on a vertical centre, steering gear being provided for guiding the machine when it is moved from place to place. The excavating tool or shovel when operating describes the arc of a circle, and cutting upwards, raises and deposits the earth or material in buckets attached to an endless chain, which passes over a top roller that is supported by a vertical frame. As these buckets in succession approach the highest point, they are thrown over, and discharge their contents into a shoot, which delivers at the side of the machine into trucks or carts. The cutting tool is supported by a weighted lever, which yields when the tool comes in contact with any hard substance, and by means of suitable mechanical appliances, throws the operating part of the machine out of gear with the driving power.

[Printed, 10*d*. Drawing.]

A.D. 1865, September 21.—N° 2405.

WATKIN, William. — This invention relates to apparatus, applicable to the furnaces of locomotive and other boilers, also blast, smelting, and other furnaces, for the purpose of effecting the consumption of smoke.

One or more tubes, formed with bell-mouths at one end and contracted to the form of a nozzle at the other, constitute air induction passages into the furnace. Both ends of these tubes are open; the smaller ends point into the furnace through apertures made in the front or sides, and are fixed in that position. Into the outer or bell-mouthed end of each induction tube, there is concentrically introduced a jet of steam, by means of a small jet pipe in connection with the steam space of the boiler. The steam blows through the induction tube into the furnace, and by driving the atmosphere forward, creates a partial vacuum in the mouth of the tube, which induces a constant inward current of air, that flows into the furnace in combination with the steam, and is distributed over the surface of the burning fuel. The effect produced is an increase of heat and consumption of the smoke. In some cases the nozzle of the injector tube is flattened.

[Printed, 10*d.* Drawing.]

A.D. 1865, September 23.—N° 2429.

BONNEVILLE, Henri Adrien. — (*A communication from Joseph Bouillon.*) — This invention relates to apparatus for lubricating machinery," which consists of an upright closed vessel, into which, by opening a tap, which is mounted on the top, the lubricant is poured through a funnel attached thereto. A central tube rises inside the vessel to within a short distance of the top, and descends into a narrow neck at the bottom, upon which the lubricating vessel is supported. The lower end of the neck is screw threaded, so that it may be screwed into the steam valve box, the cylinder or other part to be lubricated; the central pipe being sufficiently long to communicate therewith. A vertical gauge glass the ends of which communicate respectively with the upper and lower parts of the lubricator, is placed in front to show at any time the quantity of lubricating matter contained in the vessel; and when the lubricator is not contiguously placed by the part or surface to be lubricated, communication is made between them by means of a small tube, which opens into the vessel on a level with the top of the central tube. Condensation of the steam which gains admittance to the vessel is constantly going on, and as the resultant water accumulates therein, the lubricant, which floats at the top, is slowly raised, and gradually overflowing into the tubes, passes through them to the parts to be lubricated.

[Printed, 6*d.* Drawing.]

A.D. 1865, September 25.—N° 2447.

ROUTLEDGE, William, and OMMANNEY, Frederick Francis. — (*Provisional protection only.*) — This invention, *relating to presses* worked by steam and hydraulic power, comprises supplemental improvements on "Ashcroft's" compound baling press, for which he obtained a grant of Letters Patent, dated November 2, 1864, No. 2707, and which acts to first raise the ram by steam alone, and afterwards by steam and water power combined. The present invention is described as follows :—

"One part of our invention consists in attaching to two pumps "one suction valve and one delivery valve common to both "pumps; or one suction valve common to both pumps and two "delivery valves, one to each pump; or two suction valves, one "for each pump, and one delivery valve common to both "pumps."

"Another part of our invention relates to the doors of the "boxes in which the cotton or material is placed. To each door "we attach a strong hooked arm, the hooks of which are held by "a double cam when the doors are closed, but which is acted "upon through the medium of a lever and chain connected to "any moving part of the press for opening the doors when "required."

"Another part . . consists in . . reducing the friction "of the revolving boxes containing the matters to be pressed. "For this purpose we place in the top or bottom brackets, or "both, a number of rollers, wheels, or spheres."

"Another part . . relates to the steam cylinder, and consists "in employing an equilibrium valve for the admission of the "steam."

The invention is applicable to other presses worked by steam and hydraulic power.

[Printed, 4*d*. No Drawings.]

A.D. 1865, September 25.—N° 2453. (* *)

NEWTON, William Edward.—(*A communication from John Benjamin Root and William Benjamin.*)—"An improved con"struction of engine, which can be used either as a motor or for "pumping."

This invention consists in the form of the steam chamber or cylinder, and in the parts which act as the pistons and their connections; also in a novel system of packing for the pistons. "The features of novelty" specifically claimed are 1st, the combination of quadrant-shaped cylinders and *two vibrating pistons occupying* reversed positions within the cylinder, both being connected with the same crank shaft; 2nd, so arranging the connection between the vibrating pistons and the crank, that each piston, though being only self-acting, may act upon the crank during more than half of each revolution of the latter; 3rd, arranging the crank directly between the vibratory pistons and within the engine cylinder, with a separate and independent connection with each piston; 4th, connecting the side packing strips and the end packing strips of the pistons by means of pins and slots in combination with tenon and mortise joints.

To employ this engine as a pump, rotary motion is given to the crank shaft. As the pistons respectively move inward or toward the centre of the cylinder the water or other liquid enters the cylinder through their respective ports, and as they move outward the water is expelled from between them and the sides of the cylinder through the cavity in the face of the valve through the space between the two pistons, thence out through an aperture.

[Printed, 1*s*. Drawing.]

A.D. 1865, September 26.—N° 2455.

HOWEY, Richard Taylor Nelson.—This invention relates to the apparatus and mode employed for fixing tubes in tube plates. The apparatus consists of a hollow cone screw-threaded internally, and a solid cone carrying an external thread, so that the latter or male cone will screw into the hollow cone. This latter is made true externally, and divided longitudinally into a number of segments, which are held together by elastic rings or washers, so that the parts when placed in position constitute an expanding screw mandrel, which when being used, is first firmly pressed into the end of the tube about to be fixed. The inner cone by means of a wrench or handle fitted on its end, is then screwed into the expansible conic segments, which impinge divergently upon the inner surface of the tube end, thereby causing it to expand and bed to the hole in the tube.

The apparatus may, amongst other uses, be applied for adjusting or tightening the springs or packing rings of steam engine pistons, and the brasses of locomotive or other connecting rods, also to the working parts of other machinery.

[Printed, 4d. No Drawings.]

A.D. 1865, September 27.—N° 2479.

ARNOLDI, John Rodger.—(*Provisional protection only.*)—This invention, relating to the valve motion and reversing gear of steam engines, obtains amongst other advantages more direct action. As applied "to an oscillating engine, the rocking shaft "which actuates the valve spindle is the same as heretofore, but "in lieu of receiving its rocking motion from the lifting quadrant "and parts connected therewith, it is actuated directly by a "reversing stationary quadrant, the arc of which is struck from "the centre of the trunnions of the cylinder. This quadrant is "pivotted in the centre, and within it works the die or sliding "block on the lever arm of the rock shaft. By turning the "quadrant more or less, or varying the angle of the same, the "valve may be either reversed or the steam cut off to any "required degree. Any convenient or well-known mechanical "contrivance may be employed for varying the angle of the "quadrant. It will thus be seen that by the arrangement above "described the rock shaft derives its motion entirely from the "oscillation of the cylinder in conjunction with the quadrant, "whereby eccentrics are dispensed with." In other engines, the reciprocating motion of the slide block may be obtained by a single excentric or other equivalent device.

[Printed, 4d. No Drawings.]

A.D. 1865, September 27.—N° 2480.

BOFFEY, John, and SMITH, Charles William.—This invention relates to the use of certain compositions, applied as a coating on metallic surfaces for preventing the conduction and radiation of heat, and also oxidation. When applied to steam boilers, two or more coatings are required; the first, about ⅛th of an inch thick, consists of 1 cwt. of mastic, and five cwt. of whiting, to which is added about 14 gallons of boiled linseed oil; the metallic surface being rubbed over with a little linseed oil before the composition (which is about the consistency of putty) is applied. While moist it should have pieces of shell or slate stuck into it, and then be allowed two or three days to dry before the application of the second coat, which consists of 1 cwt. of Roman or Portland cement, 3 cwt. of washed sand, and 10 lbs. of cow hair; the whole mixed together with water until it is brought to a proper consistency, is applied as a coating upon the first, in thickness about half an inch, by means of a plasterer's trowel. Other coats may be afterwards added, those preceding being properly hardened previously.

For steam engine cylinders and steam pipes, two compositions, which differ somewhat from the first, are also used, and for the bilges and bottoms of iron ships, for the purpose of preventing oxidation, the compositions applied in the same manner, are further modified.

[Printed, *4d.* No Drawings.]

A.D. 1865, September 28.—N° 2494.

SMITH, Isaac, and BATHO, William Fothergill.—This invention relates to apparatus for heating, evaporating, and cooling fluids, the circulation of such fluid being, during process, accelerated by the manner in which the currents are made to flow. Descending from the upper water space, within the flues of the boiler, is a number of pendent tubes, which intercept the course of the flaming gases and hot draughts as they pass on from the furnace. These tubes are closed at bottom, and internally are longitudinally divided by thin metal plates into two, three, or more separate channels which reach nearly to the bottom and open to the water space above. Within those sides of the tubes or channels which are presented towards the fire, and are directly exposed to the greatest heat, an upward liquid current is established, and a downward current in those of the longitudinal divisions which are farthest from the fire. In some instances a single plate is used, so bent as to form separate compartments, and in other cases the plates are so soldered or joined together, as in transverse section to exhibit equidistant curved radii, or four segmental divisions. In some of the tubes, small pipes are employed; these are pressed by a spring against the hottest side of the tubes; others are concentrically disposed. Some of the tubes are made to communicate with the lower water space, and so form a transverse channel in the flue. Horizontal conical tubes are employed in the chimney flue of a vertical boiler, and a mud catcher in the upper water space.

[Printed, *1s.* Drawing.]

A.D. 1865, September 29.—N° 2502.

GEDGE, William Edward.—(*A communication from Nicolas Chenet and Pierre Jean Lacoste.*)—(Provisional protection *only.*)—

This invention relates to steam engines of a novel construction. A cylinder open at both ends, and divided internally by a transverse partition is used. The piston rod, which works steam-tight through metallic packing pieces in the centre of the partition, carries two pistons which work respectively in the two ends of the cylinder. The pistons are composed of segments, which are tightened up by nippers, operated by pointed screws from the opposite face of the pistons. Each piston has single action. The steam chest is placed at the mid-length of the cylinder, so as alternately to admit steam to each piston by means of circular plug valves, regulated by the governor. The exhaust takes place from each compartment of the cylinder at the end of the outward stroke of each piston, through openings which are uncovered thereby. The connecting rod is jointed to the piston rod contiguous to the piston face, and works into one end of the cylinder. The steam is worked expansively. Modifications are shown and described.

[Printed, 10*d*. Drawings.]

A.D. 1865, October 2.—Nº 2527.

SALISBURY, Silas Covell.—This invention relates "to the " production of gases from petroleum or other hydrocarbon, " water, and air, and their combination in such proportions of " carbon, hydrogen, and oxygen that such combined gases when " brought in contact with the gases produced from the fuel and " heated air of or generated in any ordinary furnace will unite " therewith, producing a new combination which will give when " burned a much more intense heat than can be obtained from " any ordinary combustion of coal or fuel, and which can be used " with great economy and effect in generating steam for engines, " heaters, &c., and also for heating purposes.

" Experiment has proved that a proportion of one cubic inch " of petroleum to two and a half cubic feet of water and five " cubic feet of air is suitable for the purposes desired, but such " proportion may be considerably varied with safety, and satis" factory results still be secured.

The retorts are placed on the range of furnace bars in the direction from front to back, out of contact with the sides of the furnace, and with each other when two or more retorts are used. The solid fuel rests and burns in the interspaces at the sides and between the retorts. In transverse section these retorts are from four to six inches broad at the base, and so narrow at the top as to form a flat ridge, along which there is an open slit, half an inch broad through the metal, which slit extends the whole length from end to end. This slit is covered by a loose lid, the sides of which are bent downwards. The vaporizing tubes or pans to which the oil and water are supplied, are perforated along those portions which extend into the retorts, within which above the pipes, are longitudinally disposed a number of tubes or rods which become red hot. The gases produced from the fluids, by passing amongst these heated rods become fixed gases, and as they issue from the narrow slit are deflected by the lid and brought into contact to commingle with the burning gases evolved by the solid fuel, their united combustion producing intense heat. The fire-bars are made hollow to contain water.

[Printed, 10d. Drawing.]

A.D. 1865, October 3.—N° 2529.

BONNEVILLE, Henri Adrien.— (*A communication from Benoît Bouniard.*)—This invention relates, firstly, to the manufacture, without rivetting or soldering, of sheet iron or steel cylinders, for use in the construction of boilers and vessels, and secondly, to the arrangement and construction of the rolling apparatus employed for the purpose. "A cylinder of suitable "thickness is produced by running into a mould with a core any "fusible and malleable material, but preferably steel obtained by "the process known as 'Bessemer's.' The upper roll is then "introduced into this cylinder by means of a moveable cage, "worked by a steam cylinder or otherwise, so as to allow the "roller to enter the casting. This upper roll being fixed, and "the lower one larger and moveable, the pressure is operated "from below in any suitable way. In order to join several of "these cylinders the rolls are made with grooves, so as to form "an interior flange on the female or outside cylinder, and an "outside flange on the male cylinder. To join them the female "cylinder is heated, and the male made to enter it in a cold state. "The contraction of the heated end renders it impossible to separate the two without breaking."

[Printed, 6d. Drawing.]

A.D. 1865, October 6.—N° 2567.

BROOMAN, Richard Archibald.—(*A communication from Fidèle Chatelain.*)—(*Provisional protection only.*)—This invention relates to motive power rotary engines, which when other power is applied to them will act as pumps.

" A cam shaped block is fixed in the centre of a circular case,
" an aperture in the centre of the block gives passage to a shaft
" fixed on a disc piston carrying in slots sliding vanes, there is
" an inlet and outlet passage, and between them a curved guide
" is fixed on the inside of the edge of the case. There is a cover
" fitting tight to the case, and stuffing boxes surround the shaft
" both in the case and cover. Upon steam being admitted
" through the inlet passage its course is stopped in one direction
" by the end of the curved guide, and it acts upon such of the
" vanes as are protruded from the piston by the inner fixed cam
" shaped block and drives them as well as the piston round; as
" soon as each vane passes the outlet passage the steam behind
" it escapes, and the outer end of the vane coming in contact with
" the curved guide at its rise is gradually driven in until the
" guide fills the space between the piston and the edge of the
" case. After passing the guide the inner cam shaped block
" drives out the vane to be acted on as before described, and so
" on with all the sliding vanes. When used as a pump liquid
" instead of steam is received at the inlet passage."

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 7.—N° 2587.

HOWARD, John.—(*A communication from Matthew Murray Jackson.*)—(*Provisional protection only.*)—" This invention relates
" to a novel arrangement of compound cylinder engine whereby
" the steam expanded in one cylinder can be passed directly to
" the second and larger cylinder, where it will act at a reduced
" pressure. Hitherto it has been thought necessary to provide
" a vessel or receiver, in which the steam from the small cylinder
" might be stored ready for use in the larger cylinder. Experiment,
" however, has proved that this is unnecessary, as by arranging the
" slide valves so that the one which commands the steam passages
" of the smaller cylinder shall have a larger lap than the slide valve
" of the larger cylinder, a port of the larger cylinder will always
" be open when steam is passing from the first cylinder to receive

" that steam and conduct it to the piston of the larger cylinder. " The steam having acted upon this cylinder is allowed to escape " into a condenser; the cranks with which the piston rods are " connected are set at right angles to each other and balanced, the " pistons will not, therefore, as has been customary in compound ' cylinder engines, complete their traverse together, but their " action will be similar to those of independent engines con- " nected to the same driving shaft. Thus one pair of cylinders " arranged according to this invention for marine purposes will " serve the purpose of a pair of engines, thereby effecting a great " economy both in construction and of engine space."

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 10.—N° 2604.

STURGEON, John.—This invention relates to a mode of generating steam. The ordinary boiler, containing a body of water and steam reservoir, is dispensed with, and the steam is generated in regulated quantities the moment before it is used. Within the centre of a brick lined metal furnace, is disposed a cast metal spherical chamber, which constitutes the generator, the external surface of which is enveloped by the flaming gases evolved by the fire beneath. The water feed pipe, descending through the crown of the furnace, enters the top of the generator and terminates therein in a finely perforated nozzle, through which, as the feed water is forced, it is distributed in the form of spray over the internal surface, and instantly converted into steam; the quantity of water supplied, corresponding with the consumption going on when vaporized by its sudden conversion into steam. The generator is furnished with a safety valve, and modifications, showing a departure from the spherical form are described and illustrated.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, October 10.—N° 2610.

JOHNSON, John Henry.—(*A communication from Joseph Harrison, junior, and Thomas Luders.*)—This invention relating to steam generators, is also applicable to the construction of condensers, to heating water, and warming buildings. It is supplementary to a former invention, for which Letters Patent, bearing *date 30th August* 1859, No. 1970, were granted to this patentee.

The generator comprises a number or series of flat rectangular thin hollow slabs with curved surfaces, forming numerous spaces or chambers, which communicate respectively one with another, for the purpose of receiving the water supply, and discharging the generated steam. When the slabs are packed together, these communications coincide, the plain surface of one slab coming opposite the plain surface of the next, and so on through the whole number of slabs, which are so drawn together by bolts extending through the whole series that steam and water-tight joints are formed by the respective surfaces thus brought into contact. For stationary purposes the series of slabs is enclosed by the walls of a brickwork furnace, and for locomotive or marine generators, by metal casing, the course of the flaming products of combustion being directed between the slabs, and through transverse openings in each. The pile or series of slabs is placed edgewise over the furnace, and in other modified positions to suit the particular objects of its use.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, October 12.—N° 2639.

NEWTON, William Edward.—(*A communication from Thomas Richard Pickering.*)—This invention relating to centrifugal governors, "consists, firstly, in a novel construction of and mode of " applying the springs, whereby the requisite force to counteract " in a desirable degree the centrifugal force of the balls is com- " bined with the requisite degree of flexibility; secondly, in an " improved method of attaching the balls to the springs; and, " thirdly, in an improved construction of and mode of applying " the guards by which the balls are prevented from flying out " further than is desirable from the axis of revolution. The " springs which carry the balls are each composed of two or more " leaves rigidly connected at their ends and centres, and com- " bined with sleeves through which the central shaft passes. " The centrifugal balls are centrally divided into two parts, one " of which is grooved to fit the spring, and the two parts are " secured together and made to clamp the several leaves of the " spring by means of a central screw. The guards attached to " the balls consist of forked-shaped rods, which pass round the " central spindle and thereby prevent the balls from expanding " beyond the proper point."

[Printed, 8*d*. Drawing.]

A.D. 1865, October 13.—N° 2646.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Léandre Danjou.*)—(*Provisional protection only.*)—This invention relating to a "liquid compound for purifying sea, ferruginous, "and other waters," has for its object the prevention of incrustation when such waters are used for feeding steam boilers, and also to improve their quality when such waters are used for other purposes.

The compound is made by boiling in a pan, for about an hour, 8 lbs. of water, to which is added 2 lbs. of crystals of soda, and 9 ozs. of quicklime, slaked and pulverized; the clear liquor is drawn off when cool, and is fit for use.

One hundred quarts of sea water are purified by mixing therewith 9 ozs. of the liquid compound, one hundred quarts of ferruginous waters by mixing therewith 7 ozs. of the liquid, and one hundred quarts of soft water by 4 or 5 ozs. If the compound be prepared specially for effecting the purification of soft water, the quantity of soda may be considerably reduced.

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 16.—N° 2661.

WISE, FRANCIS, **FIELD**, EDWARD, and **AYDON**, ENOCH HARRISON.—This invention relating to steam boilers and apparatus for heating and evaporating fluids, is in part applicable to other purposes, and consists—

1st. In adapting to locomotive and other boilers and apparatus, furnaces wherein the grate is so arranged, that the gases evolved by the green or partially ignited part of the fuel, shall be caused to descend and pass through the more ignited or incandescent mass of the same fire into a combustion space, wherein a due proportion of heated air is admitted to mingle with the heated gases from the fuel, in order to ensure their perfect combustion.

2nd. The use in fire-boxes or furnaces of pendent water tubes, wholly or partially coated with fire-brick or clay, and admitting air to the combustion chamber by means of passages formed through the fire-brick coating.

3rd. The application in fire-boxes and furnaces of pendent water tubes, tapering downwards and closed at their lower ends, *their upper* ends being open to the water space of the boiler;

and disposing within such tubes, smaller tubes, plain or tapered, and open at each end, for the purpose of guiding or separating the downward circulation from the ascending currents.

4th. Instead of applying small inner tubes, unequally dividing the internal space of each pendent tube by a vertical partition, so as to form separate passages for the ascending and descending currents, when the water is in a state of ebullition.

5th. Generating steam, by intermingling superheated steam, hot air, or heated gases, separate or combined, with water in a state of minute subdivision.

6th. Effecting the intermixture of superheated steam, hot air, heated or other gases, with comminuted water by means of a suitable injector tube.

7th. Extracting salts or other matter from water, preparatory to its use in steam boilers.

8th. Causing the induction of petroleum or other liquid fuel into steam boiler and other furnaces or combustion chambers, by the impulsive force of a jet or jets of superheated or other steam, and in such manner, that it may be vaporized and distributed over the surface of the burning fuel.

9th. Adapting means for raising and adjusting baffling blocks in furnaces, for the purpose of regulating the draught to suit variations in the steam pressure; and making such blocks with hollow passages for the purpose therein of superheating steam.

10th. Constructing boilers or generators, formed with pendent tubes containing inner tubes or diaphragms, or with deflectors at their upper ends (according to the Specification of the Letters Patent dated November 1st, 1862, No. 2956) " in the form of a " number of vertical or nearly vertical pipes or cells, which are " connected together at their lower ends, so that the water or " liquid to be heated or evaporated may maintain the same level " in all of them, their upper ends being similarly connected for " the purpose of carrying off the steam or vapour generated as " required."

11th. Preserving boilers and metallic evaporating vessels from corrosion, by suspending therein a metallic piece or slab, so connected by means of a metallic wire or band with the metal forming such vessel, as to produce galvanic currents, and divert the action of any acid or acids contained in the water or liquid.

[Printed, 3*s*. 4*d*. Drawings.]

A.D. 1865, October 17.—N° 2676.

SICARDO, François Georges.—This invention relates to apparatus applicable to steam boiler and other furnaces, for the purpose of consuming smoke, increasing heat, and assisting combustion. It consists in causing the hot air and smoke evolved in the furnace, to deviate from the regular flue passage to the chimney, and course through another channel, which in transverse section is four times the size of the regular flue. This channel is divided by a diaphragm into two passages of unequal size; the lower or smaller passage carries off to the chimney the heaviest portion of the hot draught, and through the upper or larger passage, the smoke and lighter portion of the gases are by the aid of a fan conveyed to a reservoir, a part or all of the exhaust steam from the engine, being admitted to mingle with the heated current, which thence is carried forward and discharged in the ashpit beneath the furnace bars; by these means the inflammable gases and the smoke, refreshed by the gaseous constituents of the decomposed steam, are returned to the furnace through the incandescent portion of the burning fuel and consumed, the action of the apparatus keeping up a constant circulation. Scrap iron is distributed over the bottom of the reservoir, in order to assist the decomposition of the steam, and obtain a larger proportion of hydrogen.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, October 17.—N° 2682. (* *)

BEARDMORE, William.—(*Provisional protection only.*)—" Improvements in furnaces " for puddling and reheating, and for steam boilers. The furnace consists of a trough for containing the fuel, covered over at the top and having fire-bars at the end, " through which the air passes horizontally among the layers of " fuel." The top has openings for supplying the fuel, and heated air may be admitted through a hollow bridge.

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 19.—N° 2697.

GHISELIN, George Reverdy.—(*A communication from Edward Clark.*)—This invention relates to apparatus for forming or ring the mouths of boiler or other tubes, and consists of a short tube, of cast iron or other metal, about three inches long, and a split collar or gland. " The tube has a flange or lip at one " end and is of conical form, that is, it is of less diameter at the " other end than it is at the flange end. The spring collar or " gland, which is cylindrical, is composed of two pieces of metal " split longitudinally and made of wrought iron or other suitable " metal, and the end of one of them is turned back or lapped " over to about the width of an inch and a half over the other " piece of metal, which is of shorter length and surrounds it; " and the gland so formed is put over the flange tube so that the " lapped end shall be at the smallest end of the flange tube, and " it is then ready for use. When it is desired to repair the end " or mouth of the boiler tube or flue of a steam engine, the " flange tube with the gland thereon as aforesaid is forced into " the end or mouth of the boiler tube, and by such pressure of " the flange tube the gland is expanded against the interior of " the boiler flue and fixed, and the mouth is thus formed or " repaired."

[Printed, 6*d*. Drawing.]

A.D. 1865, October 19.—N° 2700.

ADAMS, THOMAS, and **PARSON**, GEORGE JOHN.—(*Provisional protection only.*)—This is an invention applicable to steam slide valves, pistons and glands, which are so constructed, that the steam pressure acts simultaneously on the opposite surfaces, and is thereby balanced. It " consists in forming and con" structing the valve so that the portions of the top surface " thereof which are exposed to the pressure of steam from the " boiler may be equal in area to the whole of the bottom surface " thereof, and in inserting and fixing in the central part of the " valve between the two ends thereof a ring constructed with a " flange on its outer side over the top surface of the valve, the " top side of the flange forming a fillet to work against the door " of the valve box or division plate, and of equal area with the " bottom side of the flange. This ring is also constructed and " fitted so as to admit of an equal area of steam space above and " below its inner part. By the insertion of a ring constructed " as described, the steam from the boiler will be caused to act " simultaneously on the bottom of the flange (thereby pressing " the ring upwards against the door of the valve box or the

" division plate therein) and on the fillet or top of the flange of " equal area thereby pressing the ring downwards. The steam " from the boiler will be thus caused to act over an equal area " between the door of the valve box or the division plate, and the " fillet or top of the flange, and between the bottom of the flange " and the top of the valve, thereby balancing the pressure on the " outer part of the ring. The recess or steam space at the top " of the inner part of the ring is equal in area to that at the " bottom of the same, and the ring is balanced by the pressure " of the exhaust steam acting equally therein." Rings constructed as described, are applicable as metallic packings for pistons and glands.

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 20.—N° 2712. (* *)

WHITE, John.—(*Provisional protection only.*)—" Improvements " in the furnaces of, and means of heating the feed water for " steam boilers." The grate bars are made hollow, and are united by a hollow cross bar at each end, so that the feed water can be introduced at one end and received at the other into a cistern. With locomotives and other boilers the framework of bars has an opening at the back, with a door " constructed of hollow bars " similarly united, and the water in it connected with that in the main grate. This door can be opened to allow the fuel on it to drop into the ash-pit.

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 23.—N° 2738.

CHAPLIN, Alexander.—This is an invention relating to steam boilers, the parts of which are so arranged and combined, that heating surface is increased, a large combustion chamber obtained to facilitate the burning of inferior qualities of fuel, and the smoke consumed. The boiler is of the vertical cylindrical class, containing a high slightly conical fire-box, closed at the top by a tube plate, in the centre of which there is a small circular opening leading to the uptake, which extends through the steam space, and thence to the chimney above. The covering tube plate of the furnace, is perforated to receive an annular arrangement of pendent tubes, the lower ends of which are closed and reach nearly to the fire. These tubes, in consequence of the rising form given to the tube plate, incline to each other, so that the central space caused by the opening to the uptake, gradually closes up towards the fire. Fire clay disposed in the lower part of the space, causes a general divergence of the flaming gases towards the furnace sides, whence they incliningly course convergently amongst the tubes towards the upper part of the space, and upwards through the opening into the uptake, which expands in transverse area to the top of the boiler, where it unites with the chimney.

[Printed, 8d. Drawing.]

A.D. 1865, October 24.—N° 2746.

MATTHEWS, Charles, SOUTHWICK, Henry Booth, and FEREDAY, John.—(*Provisional protection only.*)—This invention, relating to the construction of the furnace flues of steam and other boilers for effecting the consumption of smoke, consists in arranging "a bridge flue and a series of traversing flues, partly " open and partly capable of being closed by dampers; in the " damper flues the smoke is retained until burnt by the flame " which traverses the open flues . . . . The first take-up flue " is over the centre of the bridge; this traverses to the end of the " furnace, at which point there is a draught hole meeting the " flame; it then returns and comes down one side, then passes " transversely through the double bridge, and ascends the other " side of the furnace into the stack. The damper flues are built " one over each of the open flues; these damper flues retain the " smoke, whilst the draught draws the flame along the open " flues; all these flues travel some under, some along side the " boiler, and meeting at the hollow bridge, the flame meets the " smoke and thus consumes it, any incombustible product passing up the stack; the top of the hollow bridge is covered with " open laid brickwork to allow the flame from the fire to act " upon the smoke flue. There will require to be a soot door in " front near the bridge for the purpose of clearing out the bridge. " By the employment of a furnace thus constructed we not only " consume the smoke but manufacture breezes most economically, " for it enables us, after throwing in the slack, to employ refuse " ashes from other fires upon the top of the slack, thus reducing " the slack to breezes, and providing heat by the combustion of " the smoke, which heat may be employed under boilers or in " any other manner required."

[*Printed, 4d. No Drawings.*]

A.D. 1865, October 26.—N° 2759.

HUNT, EDMUND.—This invention "comprises various improve-"ments in steam engines," relating to simple and compact construction, efficiency in use, reduced friction and liability to derangement, and lessened wear. It consists first, in "the intro-"ducing of levers with connecting rods or bows, and carried in "fixed bearings in engines with oblique crank pins; second, the "using of one valve movement (with one or more valves) to work "two or more cylinders, the strokes of which cylinders are made "at different times; third, the actuating of the valve or valves "with a continuous circular plane sliding motion for working "two or more cylinders by one valve movement, or for obtaining "a simple cut-off action, or for both these purposes; fourth, the "dividing of the valve and giving reversed motions to its parts "in order to reduce the travel; and fifth, the causing of steam to "work between pistons performing their strokes at different "times, in order . . . . . to relieve the crank or cranks "and other parts, of ineffective and injurious strains when at or "near the dead centre." Five sheets of explanatory drawings represent examples of the various modifications of which the several parts of the invention are susceptible, the details whereof are fully described.

[Printed, 3*s*. 6*d*. Drawings.]

A.D. 1865, October 26.—N° 2761.

DAVIES, GEORGE.—(*A communication from Abraham Egenton.*) —This is an invention of apparatus for cleansing the tubes of steam boilers, which is accomplished by the force of a jet of steam, directed into the mouth in succesion of each tube, which has the effect of dislodging and blowing out all accumulating deposits of dust or ashes. The apparatus consists simply of a pipe attached to a flexible tube; this pipe is similar to the hose pipe of a fire engine; it is operated by the attendant, who directs it seriatim into all the tubes. At the butt end of the pipe, to which the flexible tube is attached, there is a stop cock, which is opened and closed by the attendant to shut off and turn on the steam, whilst changing the nozzle of the pipe from tube to tube, the flexible tube being sufficiently strong to bear the steam pressure.

[*Printed*, 6*d*. Drawing.]

A.D. 1865, October 28.—Nº 2776.

JORDAN, Thomas Brown.—This invention relates to a combined arrangement of cylinders for generating steam. These cylinders are made by rivetting, welding, casting, or otherwise; they are left open at each end, and are afterwards closed by cast-metal covers, drawn together by long bolts, which pass through from end to end of the cylinders, the ends whereof as well as the inside of the covers, are made true, so that a steam-tight joint is formed by the pressure and the interposition of a little putty or other such like material. The cylinders are of considerable length; they are vertically disposed in a series of rows inside an oven contiguous to a brick furnace; about three-fourths of their length is occupied by water, and the remainder forms the steam space; they all communicate both for the feed water supply and the steam. The flaming gases are, by means of stop or baffling plates, made to take a lateral course, crossing and recrossing many times amongst the tubes in passing upwards from the bottom of the oven before the top is reached, where the communication with the chimney is regulated by a damper.

[Printed, 1*s*. Drawings.]

A.D. 1865, October 31.—Nº 2805.

EMMET, Charles.—This invention relates to steam hammers, and to the means for applying them in the manufacture of boilers and tubes.

1st. The rendering steam hammers self-acting, by means of apparatus which reverses the valve immediately after the delivery of the blow. A weight, supported on a spring attached to the piston rod, and carried thereby, is employed. To the piston rod is attached a bell-cranked lever, and another bell-cranked lever is hinged to the cylinder, and connected by one arm to the valve spindle. The momentum acquired by the weight during the descent of the hammer, by overcoming the spring, allows the weight to move forward and act upon the first named lever, which by operating upon the second lever reverses the valve, and opens the exhaust above the piston, so that the steam, which is always at the underside, will cause the piston to make the return stroke.

2nd. Adapting steam hammers for use in ordinary forge or smith work, so that by means of a treadle, they are made to strike with any required force and speed. The treadle, in addition to a rocking motion for regulating the blow, is capable of a sliding movement for acting on the throttle valve.

3rd. Applying steam hammers to the rivetting of cylindrical steam boilers and tubes. An apparatus in the form of a cross with a strong central boss, is transversely fixed inside the boiler or tube by means of radiating screw bolts. Through the boss there is, fitted to slide longitudinally, a strong square bar, which carries at one end a lateral arm, whereon the hammer is fixed. The radial position of this arm is changed by means of a worm and worm wheel, and the longitudinal adjustment of the square bar is effected by an internal screw.

4th. Consists in so constructing steam hammers, that either the anvil or its block, or the stand which supports the hammer is thrown out of level with the face of the hammer block, so that the two surfaces are caused to operate relatively at an angle, and produce an inclining surface on the metal under operation. Also either the anvil or the anvil block is caused to slide, in order that any particular part of the metal which is being operated upon, may be brought under the action of the hammer.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1865, November 4.—N° 2849.

O'NEILL, Patrick Benignus.—This is an invention of self-acting apparatus for feeding steam boilers. Resting within the boiler upon the surface of the water, is an ordinary float, suspended to a chain by metal wire which passes upward through the boiler shell. This chain is carried over a grooved pulley, and suspends a counter-balance weight on the other side. The axis upon which the pulley is fixed is supported by an upright standard, and carries a toothed sector. This sector gears into another sector, which operates the lever handles of two stop cocks or equilibrium valves, when by the rising or falling of the float the apparatus is set in motion. These valves or cocks govern the separate communications between a closed vessel and the steam space of the boiler, and between the vessel and the water supply. When the vessel is nearly filled with water drawn up by a vacuum previously formed therein, as soon as the float sinks the communication with the steam space of the boiler is opened, and steam admitted into the *vessel above the water,* which as soon as the pressure in the vessel is equal to the pressure in the boiler, flows into the latter through a down pipe, which is opened and closed by a back pressure valve. The rising of the float closes the steam valve; a vacuum then forms in the vessel, which being refilled thereby from the water supply, is ready for the next discharge so soon as the steam valve is opened by the sinking of the float.

[Printed, 10*d*. Drawing.]

A.D. 1865, November 4.—Nº 2853.

THYS, JAMES.—(*Provisional protection only.*)—This invention relates to a non-conducting composition, to be used for covering or coating steam boilers, steam pipes, and apparatus where steam is employed for power or otherwise. It may also be used as a protection against cold, for covering pumps, vessels, water pipes, and apparatus exposed to the action of frost and low temperatures. The composition is composed of the following ingredients:—"About "fifty or sixty parts by weight of siliceous earth, (by preference "that which is known as "Charlton earth"), about 30 parts by "weight of coke dust, about 35 parts of carbonized sawdust, 3 lbs. "of cow hair, 1½ lb. of common size, 1 lb. of refuse cotton seed "or other cheap oil or grease, the oil or grease being mixed with "the raw sawdust in the carbonizing vessel or other apparatus "employed, in order to produce a greasy smoke during the carbonizing process, which greatly increases the quantity of lamp "black in the bulk of the charred dust. The above ingredients "are formed into a paste (by means of a pug mill or other suitable apparatus) in combination with about 80 per cent. of water, "and applied in the manner well understood for the purposes "above described." The relative proportions of the ingredients may be varied, and ordinary lamp black may be employed with suitable quantities of other carbonaceous materials.

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 8.—Nº 2881.

BEARD, NEVILLE, and MAIDEN, JOHN.—This "invention is "designed for the purpose of lubricating the interior surfaces or "frictional parts of the cylinders of steam or other motive-power "engines by self-acting mechanism, in such a manner that the "lubricant can be supplied to or injected against any portion of "the internal *frictional* surface at regular intervals or at any time cage, to the sides, whereby danger from a falling chain or any portion of the over-head gear is removed.

[Printed, 10*d*. Drawing.]

A.D. 1865, November 11.—N° 2908.

LAKE, Robert William. — (*A communication from Dyer Williams*).—This invention relates to the manufacture of crank axles for locomotive steam engines, which in contra-distinction to those crank axles formed out of the solid metal, are according to this invention, made in three separate sections, which are afterwards fitted together. The ends of the parts constituting the shaft are turned down to fit accurately into holes bored in the crank arms, the faces of which abut against shoulders left on the shaft. The free ends of the crank arms are also bored to receive the crank pins, which are pivotted down to a shoulder in the same way as the shaft; the boring and turning of the parts require accurate workmanship, and when being fixed together, the crank arms are heated to a state of expansion, so that the turned ends of the shaft and crank pin may enter, and the contraction of cooling ensures a rigid union of the parts, which in addition are further secured by keys, rendered permanently fast by the use of steel or iron cross pins.

[Printed, 8*d*. Drawing.]

A.D. 1865, November 13.—N° 2920.

WHITEHEAD, James Heywood. — (*Provisional protection only.*)—This invention relates to a mode of cleansing the surfaces of apparatus to be used for heating feed water for steam boilers. The feed water is caused to pass through a number of heating pipes arranged in the boiler flue "in a series of tiers or zig-zags "lying in a horizontal position, and so fixed that all the joints are "outside the brickwork; . . . . . . between these tiers or "zig-zags, and crossing the heating pipes at right angles are "small steam pipes which are perforated, the perforations being "on each side of the steam pipes and over the centre of the heat-"ing pipes which they cross. All these small steam pipes are "connected with one main pipe placed vertically, to which steam "can be admitted as required. In place of steam, air under pres-"sure may be employed."

[Printed, 4*d*. No Drawings.]

" desired by the engineer." The apparatus consists of a closed spherical vessel or chamber, which is mounted upon the cylinder cover. The top of this vessel carries a small funnel upon a narrow neck, through a passage in which the lubricant is poured into the vessel; this passage is closed by a screw plug. A small pipe forms a steam communication between the top of the vessel and the steam chest, wherein the pressure is superior to the working pressure in the cylinder; when the apparatus is in operation this pipe is open, the pressure being kept constant upon the surface of the lubricant in the vessel. Through the neck which supports the vessel there is an outlet passage governed by a slide, which intermittently opens a communication between the bottom of the vessel and the interior of the cylinder, through a series of perforations in the lower end of the passage pipe, pierced incliningly diverging towards the cylinder sides. The lubricant, by means of a mechanical arrangement, comprising a ratchet wheel and pawl, tooth wheels, and a cam, is by the pressure of steam in the vessel, forced into the cylinder during the momentary opening of the outlet passage, caused each revolution of the cam by a devious projection in the cam path, which by means of a slotted lever, shifts and returns the slide.

[Printed, 10*d*. Drawing.]

A.D. 1865, November 11.—N° 2900.

NORRIS, James.—The object sought in this invention, which relates to " hydraulic steam or other 'lifts' for raising passengers " and goods," is the prevention of those accidents which frequently occur through the breaking of the chain or its support, in consequence of one end of the chain or chains which connect the counter weight and the lifting chamber or cage, being attached to the roof or cover of the latter, so that when the chain and overhead gear fall thereon, it is crushed in, and the occupants are either killed or injured. To avoid this the chains are attached to brackets, which are fixed to and project from the sides of the cage, and slide in vertical guides fitted up the sides of the shaft.

Brackets fitted with anti-friction rollers are also fixed low down to the sides of the cage, the rollers working up and down in vertical guides, so as to steady the chamber when in motion. By this arrangement the suspending pulleys, which carry the depending chains, are removed from their ordinary position directly over the cage, to the sides, whereby danger from a falling chain or any portion of the over-head gear is removed.

[Printed, 10*d*. Drawing.]

A.D. 1865, November 11.—N° 2908.

LAKE, Robert William. — (*A communication from Dyer Williams*).—This invention relates to the manufacture of crank axles for locomotive steam engines, which in contra-distinction to those crank axles formed out of the solid metal, are according to this invention, made in three separate sections, which are afterwards fitted together. The ends of the parts constituting the shaft are turned down to fit accurately into holes bored in the crank arms, the faces of which abut against shoulders left on the shaft. The free ends of the crank arms are also bored to receive the crank pins, which are pivotted down to a shoulder in the same way as the shaft; the boring and turning of the parts require accurate workmanship, and when being fixed together, the crank arms are heated to a state of expansion, so that the turned ends of the shaft and crank pin may enter, and the contraction of cooling ensures a rigid union of the parts, which in addition are further secured by keys, rendered permanently fast by the use of steel or iron cross pins.

[Printed, 8*d*. Drawing.]

A.D. 1865, November 13.—N° 2920.

WHITEHEAD, James Heywood. — (*Provisional protection only.*)—This invention relates to a mode of cleansing the surfaces of apparatus to be used for heating feed water for steam boilers. The feed water is caused to pass through a number of heating pipes arranged in the boiler flue "in a series of tiers or zig-zags " lying in a horizontal position, and so fixed that all the joints are " outside the brickwork; . . . . . . between these tiers or " zig-zags, and crossing the heating pipes at right angles are " small steam pipes which are perforated, the perforations being " on each side of the steam pipes and over the centre of the heat- " ing pipes which they cross. All these small steam pipes are " connected with one main pipe placed vertically, to which steam " can be admitted as required. In place of steam, air under pres- " sure may be employed."

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 14.—N° 2928.

LOUBAT, Joseph Alphonse.—This invention, relating to locomotive engines and railway carriages, consists of a vertical steam generator contained within a cylindrical shell, enclosing water and steam space. The furnace is circular and disposed concentric with the shell; it is covered by a tube plate which receives the ends of a numerous group of vertical flue tubes. The tube plate which receives the upper ends of the tubes, constitutes the bottom of the smoke-box; the sides, which are surrounded by steam space, contract towards the top of the generator, above which it is closed by a plate. The pipe which conducts the steam from the steam space, is passed through the smoke-box in ascending spiral coils, in order to superheat the steam before it reaches the cylinders, whence, after having produced its effect, it escapes through a blast pipe in the chimney. The boiler, and the steam cylinders, which are inverted, are mounted on a covered truck, which supports the fore-part of a passenger carriage. Motion is transferred from the crank shaft to the driving axles, by means of differential gearing, brought into activity by clutches. Suitable breaks are applied to the wheels, an apparatus is placed in front to clear away obstacles, and all the carriages are mounted on jointed trucks.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1865, November 17.—N° 2963. (* *)

TENNANT, Thomas Maxwell.—(*Provisional protection only.*) —Improvements in smoke consuming furnaces, based upon Specification No. 738, A.D. 1860. Beneath the dead plate of a boiler furnace is a chamber fixed transversely, the inner end of which receives the ends of hollow fire-bars. In the under side of the chamber are openings for the passage of the air into these furnace bars, through which it passes and issues into another chamber in the bridge, furnished with openings extending upwards and downwards, whereby air is admitted to mingle with the burning gases.

[Printed, 4*d.* No Drawings.]

A.D. 1865, November 21.—N° 2990.

BENNETT, Samuel.—This invention relates to high-pressure *steam cocks,* water, air, and gas cocks, gauge cocks and water gauges for boilers, and sediment tubes for cocks and pipes, and consists—

1st. In making two or more distinct passages through the plugs of such high-pressure cocks as have ordinary solid bottoms, in order that the metal which divides the passages, may add strength to the plug and prevent its yielding to compression. For keeping the plug down upon its bearing an adjusting screw and lock nut are employed, and to prevent leakage, the screw, nut, and spindle, are inclosed by a cap.

2nd. Gauge cocks are constructed with two or more separate passages through the plug, which correspond severally with an equal number of tubes, with ends turning up to different levels, inside the boiler. By means of one of these gauge cocks, different levels are indicated at the same time.

3rd. Consists in making slotted openings in the opposite sides of the frame or case which contains the glass tube of a water gauge, in order that the level of the water may be better seen; and for preventing the escape of steam between the tube and the frame, the top end of the latter is covered with a cap. The lower end of the frame is screwed into a chamber on the body of a two way cock, one way for the water and the other for the steam, which reaches the cap by means of a tube passed up inside the glass tube, within which, surrounding the small tube, there is a light substance which floats upon and indicates the water level.

4th. Employing and combining sediment tubes and sockets with water gauge and other cocks and pipes connected to boilers and vessels, for the purpose of preserving such cocks and pipes in a clean condition; the tubes or sockets being made to fit into recesses formed in the ends of the cocks and pipes, can be removed without further disturbing or interfering with the cock or pipe.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, November 21.—N° 2996.

NEWTON, Alfred Vincent.—(*A communication from Addison Calvin Fletcher.*)—This invention relates to apparatus, in which the abstraction of heat from exhaust steam, is wholly or in part effected by means of cold air, which is thereby heated for the supply of oxygen to the boiler furnace, or other purpose, whilst the steam is condensed, and the resultant water returned to the boiler. The steam is directed through suitable pipes into narrow passages, formed in a chamber by so disposing thin metal radiating plates, that alternate distinct steam and air ways fill the chamber. Through the air passages a forced current is kept up by a fan, thereby carrying off the heat, which is constantly passing through the thin plates from the steam in the intermediate passages. In this manner the air is heated by the hot steam, and is forced on to the ash-pit and furnace to assist combustion, and the hot steam is condensed by the cold air, the water of condensation being again returned to the boiler. That portion of the steam which escapes condensation in the passages, may be afterwards brought into contact with surfaces cooled by cold water jets.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, November 25.—Nº 3025.

LYTTLE, William Alexander. — (*Provisional protection only.*)—This invention relates to the combustion of fuel in furnaces.—" I supply the furnace with air by means of forcing pumps " or other apparatus for a like purpose, and I prevent the free " egress of the waste gases of combustion by means of a trap or " valve so fitted and pressed down or loaded that the waste gases " can only escape when it is brought into action by displacing it " after the manner of steam rushing from a safety valve, a con- " stant pressure being thus maintained in the atmosphere of the " furnace. By such means the fuel will be burned under com- " pression (and therefore energetically), whilst the heat so gene- " rated will be retarded in its escape, and will so exercise in its " transit a much greater effect than at present. This plan is " applicable to every form of furnace where the chimney can be " trapped or throttled as described, and in reverberatory furnaces, " when it can be applied, it will immensely augment the efficiency " of the fuel used. In the steam engine its adoption will only " necessitate the employment of an air-tight fire-box and smoke " box. The fire-box should be provided with ports which " though air-tight when closed, will admit when opened of the " introduction of fuel and of free air, and also of the removal " of ashes. The smoke box should also be closed with a port " or valve which, when open, together with the apertures in the " fire-box for the admission of free air, will allow the fire to be " lighted as at present, and the engine to be employed as an ordi- " nary engine on the existing plan of heating. In addition to

" the port or valve in the smoke box to which I have referred " there should be, supposing the latter to be unyielding to the " internal pressure of gas, a valve like a common steam safety " valve for the purpose of regulating the pressure of the gases in " the fire-box. The engine would of course be provided with air " pumps for forcing a supply of air into its furnace."

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 25.—N° 3026.

DRAPER, James, and LEECH, William.—This invention relates to facile means for cleansing the internal surfaces of the water gauges of steam boilers, and " consist, first, in obtaining " direct communication with the boiler from the outside of the " gauge, by forming an aperture through the metallic elbow " fitting, to admit of a cleaning instrument being passed directly " through and into the boiler (if required,) and also up the glass " tube; this aperture may also be formed through the spindle of " the ordinary blow-off valve according to the position in which " the gauge is used, and in either case the aperture is to be closed " by a screw or plug; and in order to shut off the water from " the boiler whilst removing and replacing the said screw or " plug, we apply a plug tap between the said aperture and the " boiler, which application constitutes the second portion of the " invention."

[Printed, 8*d*. Drawing.]

A.D. 1865, November 25.—N° 3029.

BENNETT, John Francis.—This invention relates to raising progressively increasing degrees of heat in a series of furnaces during the combustion of carbonaceous fuel, by the introduction at intervals of blasts of air, so that the products of combustion evolved from the first fire by the first blast shall mingle with the second, and the new elementary product of the second, mingle with the third, and so on in succession, the volumes of air increasing with each successive blast, whereby intense heat is ultimately produced. The invention is described in reference to smelting furnaces, the air being blown in at different altitudes; also to reverberatory furnaces, and to steam boilers.

As applied to a Cornish boiler, there are three furnaces, filled with fuel and *disposed* at intervals beneath the boiler, so that each forms a permeable bank of burning fuel in contact with the bottom. The blast passes transversely in succession through the different furnaces, in the direction from the front to the back of the boiler, whence the heat is carried into the flues. The first blast is applied to the fuel in the first furnace at the side of the fire, and the second blast, double the volume of the first, is applied at the other side of the fire, to mingle with the burning products of combustion therefrom, which are carried through the fuel in the second furnace, immediately beyond which another blast of increased volume enters, and the whole collective current passes through the fuel in the third furnace, the intensity of the heat accumulating as the combined products of combustion from the several furnaces, mingle at each stage of their progress with increased volumes of air.

[Printed, 1*s*. Drawing.]

A.D. 1865, November 27.—N° 3037.

GEDGE, William Edward.—(*A communication from Jean Gabriel Alphonse Appé.*)—(*Provisional protection only.*)—This invention relates to a "steam wheel, and to apparatus connected therewith." The wheel is constructed somewhat similar to a water wheel, the paddles or pistons being acted upon by the force of steam, instead of by the weight of water. It is embraced by a fixed casing which constitutes a steam chamber, against which the circumferential surface of the wheel rotates in steam-tight frictional contact; this steam chamber extends three-fourths round the wheel. As the wheel revolves, four radial piston slides are brought into action by means of rollers, which traverse an eccentric cam path fixed round the axis. These slides are diametrally united in pairs, by rods which pass through the axis, one radially diverging simultaneous with the convergence of its companion slide on the opposite side of the axis. The steam acts against the face of the piston slides at right angles to the radii of the wheel, and its course can be changed at will by means of a steam cock, so as to reverse the revolving direction of the motion of the wheel. The power obtained is to be applied to general purposes.

[Prined, 4*d*. No Drawings.]

A.D. 1865, November 28.—N° 3048. (* *)

GE, William Edward.—(*A communication from Antoine r-Perroton.*)—"An improved method of utilizing the waste "heat of coke ovens," for firing steam boilers, and lime, quartz, and other kilns.

The boiler is set between two ovens, the heated gases from each of which are led beneath and around the boiler through flues, and into the chimney; or the dampers regulating these openings may be closed in order to conduct the gases through other side flues direct into the chimney. The action of the gases from the ovens may be aided by burning coal on an ordinary grate.

When a kiln is to be thus adapted, it is set at an angle, and is made of a tapering shape from the ovens. Its highest end is also towards the chimney, and the lime being there fed in from a door, it slides down towards the hotter end. Several flues conduct the gases from the ovens direct into the chimney.

[Printed, 10*d*. Drawing.]

A.D. 1865, November 28.—N° 3051.

SIMONS, William and BROWN, Andrew.—(*Provisional protection only.*)—This is an invention of means for preventing the radiation of heat from the surface of steam engine cylinders, which consists in lining the cylinder with material or medium of slow heat conducting power. That which is preferred is wood, which is prepared in longitudinal slips or staves to fit round the inside, their sides all jointing in radial lines, so that when forced into place, they are securely bound or held together by the circumferential pressure of the cylinder. Other means for securing the lining slips, such as metal rings, bolts, or guides, may be resorted to, and the covers, bottom, steam chest, .and piston faces, may be lined with the same material if considered necessary. In some instances a cylindrical shell of thin metal may be employed as an inside covering to the wood.

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 29.—N° 3062.

LANCASTER, Thomas.—The object of this invention, which relates to apparatus applicable to steam boiler and other furnaces, is to effect the more perfect combustion of fuel, and the consumption of smoke. This is accomplished by the admission into the furnace of currents of atmospheric air, which are directed over and upon the burning fuel. The inventor says :—

3 a 2

"For this purpose I admit air on the top of the furnace or " other fire by means of air pipes and other passages inserted " under the grate and communicating with an air chamber or " chambers, up which the air rises by the side of the fire, and is " deflected thereon by means of a brick or other deflector or " deflectors against which it comes in contact. Over the fire- " door, or inserted therein, I also form an opening and deflector " for the admission and conduction of air, and the quantity thereof " in both cases can be regulated to the greatest nicety by dampers " or other similar means."

[Printed, 8*d*. Drawing.]

A.D. 1865, November 30.—N° 3077.

NORTON, James Lee, and LANDLESS, James.—This invention relates to apparatus for registering the speed of machinery, and the pressure of steam and fluids. The apparatus consists of a drum, which is lapped with paper prepared with checkered lines, and rotated at a slow uniform speed by clockwork. By means of suitable mechanism, actuated by the speed of the engine or machine to be registered, a pencil pointing to the drum, so as lightly to touch the paper, is made to traverse from end to end, longitudinally across its face, and after having reached the opposite end of the drum is suddenly returned to the starting point by a spring. If the engine or machine is moving at a uniform speed, the register on the paper will exhibit a straight diagonal line, but if not, the irregularity will be ascertained by the deviations of the pencil mark on the checkered paper, whereby the amount may be computated.

For registering steam and fluid pressure, the apparatus must be modified, in order to make the pressure the means of traversing the marking pencil across the drum, which is in the same manner rotated by clock-work.

[Printed, 10*d*. Drawing.]

A.D. 1865, December 2.—N° 3095.

WILSON, Edward Brown.—This invention relates to steam [illegible], puddling, and other furnaces. As applied for generating [illegible] a horizontal two-flued boiler, the furnace is attached to [illegible] *end, and* a bridge is built across, a short distance within each of the boiler flues. The fire rests upon a cast or wrought iron fuel plate, which reaches across the furnace, and sloping downwards extends from a nearly vertical grating, which is placed in front, to the back of the furnace, where it overhangs a closed ash chamber. An air passage is formed beneath the fuel plate by another sloping plate, which also extends from side to side. Over the back of the furnace there is an inverted bridge or arch, which keeps back the fuel, and mounted upon the top of the furnace, disposed so as to drop the fuel in front of this bridge, there is a hopper, which is closed with a removable lid. Opposite the grating in front are the fire-doors. The air current necessary to support combustion enters beneath the front, and passing to the back courses upward through the air passage formed beneath the fuel plate into a narrow chamber, which exists between the grating and the furnace doors; thence it passes through the grating and through the mass of burning fuel to the flues. Other steam boiler furnaces, modified in detail, also reverberatory puddling furnaces, are shown and described.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1865, December 5.—N° 3122.

TOTH, Joseph.—(*Provisional protection only*).—This invention relates to the purification of feed water for steam boilers, and consists of two parts, 1st, an upright sheet iron cylindrical covered vessel, 18 ft. high and 6 ft. diameter, transversely divided by a tube plate into two chambers, respectively 6 ft. in height the basement or steam chamber, and 12 ft. the upper or water chamber, which is closed by a hemispherical top provided with a central steam outlet. Numerous copper tubes, open to the water above are fixed in the tube plate, and descend into the lower chamber, which receives the exhaust steam from an engine connected therewith; a pump keeps the upper chamber supplied with water, which being heated to 80° Reaumur, overflows through a pipe into—2, which consists of a series of covered gutters, suitably inclined; thence the water passes into similar open gutters in a tank, whence it is raised by a pump, in a pure state, into the injector which supplies the boiler. During the heating and passage of the water, all solid and incrusting matter is deposited.

[Printed, 8*d*. *Drawing.*]

A.D. 1865, December 5.—N° 3130.

BROWN, Andrew Betts.—The object of this invention, relating to steam cranes and hoists, is to avoid the danger which arises when the lifting chain breaks from excessive straining. It is more particularly applicable to those cranes and hoists, whereby the lift is obtained at a single stroke of the piston in a steam cylinder. During the return stroke, whilst the steam is acting upon one side of the piston, water is admitted into the cylinder on the other side, and this water is ejected during the lifting stroke, and returns to the tanks whence it is drawn. "The orifice through which " the water is admitted and expelled is of comparatively small " size, and it is capable of regulation by a stop-cock or otherwise; " by this means the speed of the piston can be adjusted as may " be desired, as the piston can only be driven by the steam as " fast as the water is able to escape from the cylinder, which of " course depends on the size of the regulated orifice through " which it passes, so that even should the load on the chain be " suddenly removed by the breaking of the chain or otherwise, " but a slight acceleration in the motion of the piston will result. " To prevent the chilling of the cylinder the water employed is " kept hot. The arrangement above described is useful not only " to prevent damage should the chain break, but also because " it regulates the working speed of the machine."

The apparatus may be employed for supplying water to steam boilers.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1865, December 6.—N° 3140. (* *)

ENNIS, William.—(*Provisional protection not allowed.*)—A " fire-pot and retort for stoves, ranges, and furnaces in which " steam is generated and superheated." It consists of several chambers opening into each other, in the first of which the steam is generated, and in the last "the superheated steam is discharged in jets through small holes into the fire." The first chamber is supplied from a water tank; its steam passes to "the " superheating port of the fire-pot," and thence through pipes into the discharging chamber.

[*Printed, 4d.* No Drawings.]

A.D. 1865, December 6.—N° 3141.

NEWTON, William Edward.—(*A communication from Robert Winslow Davis, Daniel Davis, and Henry Sheldon Anable.*)—This invention relates to the construction of vertical steam boilers, and the furnaces and fire-grates of such and other boilers and fire-places. The boiler comprises an upright cylindrical shell, which is covered with wood staves and a coating of felt. Concentrically within there is a cylindrical chamber, which is closed at the lower end by the roof of the furnace and forms the water and steam space. A fuel tube descends through the top of the boiler and the central water chamber, and opens over the centre of the furnace. Circumposed in the central chamber around the fuel tube, is a series of upright tubes or "gas mixing chambers." These are set into the plate which forms the roof of the furnace, and are closed at their upper ends, which extend upwards into the steam space. A narrow concentric flue surrounds the water chamber, and a narrow annular water space is formed between the flue and the shell of the boiler. The furnace grate forms a kind of circular basket with radiating bars; it rises considerably in the centre towards the lower end of the fuel tube, and is supported underneath upon a central vertical screw, whereby when required it can be lowered out of the furnace. The lower part of the annular flue is open to the furnace, and the upper part, extending upwards into the steam space, communicates with the chimney flue. A number of separate winding passages are formed up the annular flue by spirally coiled water pipes, which correspond in diameter with the breadth of the flue, and their ends communicate respectively with the upper and lower water spaces of the boiler. The fuel is fed at the top of the boiler into the upper end of the central tube, which is closed by a suitable cover. A jet of steam directed downwards, plays upon the column of fuel, which rests upon the raised centre of the fire-grate, and active combustion goes on all round; the hot gases circulate in the vertical mixing chambers, and the flaming products of combustion are carried up the winding passages in the annular flue and away to the chimney.

[Printed, 10*d*. Drawing.]

A.D. 1865, December 9.—N° 3184.

WHEELER, Norman Willis.—This invention relates to steam boilers, and to apparatus for cleaning the flues.

The steam boiler described is of the cylindrical vertical class, containing a circular furnace and ash-pit surrounded with water space at the sides and beneath. The upper section of the boiler is fitted with a multitubular arrangement of vertical flue tubes, the lower ends of which are fitted into a tube plate which forms the roof of the furnace, and the upper ends are set into a tube plate which forms the boiler top. A central circulating water tube forms a communication between the upper section of the boiler, and the water space below the ash-pit, passing down through the centre of the furnace and fire-grate. The fire-grate surface is formed by a series of segmental castings, superposed radiatingly round the central tube, resting on angle iron fixed round the tube and the interior of the furnace. Level with the top of the furnace, fitted at intervals round the boiler, are several openings strengthened by surrounding frames, and made for easily reaching every part of the furnace roof, for the purpose of removing therefrom all matter deposited by the water amongst the lower ends of the tubes.

The cleaning of the flue tubes is effected by creating a strong draught in one or more tubes at a time, by means of a jet of steam, the impulsive force of which when directed towards the chimney, draws out of the tube or tubes all soot which may have lodged therein, the draught caused by the steam being confined to one or two tubes by means of a short pipe, which is placed over so as to inclose the end or ends of one or more fire-tubes, the jet pipe entering laterally through the side of the short draught pipe near to one end, directs the steam and blows the soot out at the other.

[Printed, 1*s*. Drawings.]

A.D. 1865, December 9.—N° 3185.

FAIRLIE, Robert Francis.—This invention relates to the arrangement of locomotive engines, and to their steam boilers. It is supplementary to a prior invention, for which Letters Patent were granted to this inventor, bearing date, May 12, 1864, No. 1210. The boiler improvements relate to the construction of the fire-box and surrounding shell, which is shaped to " the form of " a bay or half moon," thereby providing additional standing oom for the engineer, without lateral extension of the foot plate; er forms may be given to the furnace, by dividing each side into surfaces at an angle to each other. The ordinary fire-bars are dispensed with, the furnace being surrounded with water space six inches broad, and the air necessary for combustion being admitted through hollow stays or otherwise. Hoppers are provided for the introduction of the fuel, and arrangements made for the combustion of petroleum or other inflammable oil. The above improvements constitute the first part of the invention. The second part relates to the disposition of the engine and boiler, on bogie frames calculated for light weight or traffic, yet "retaining "all the bite of the wheels and driving power due to the whole "weight of the boiler and its accessories," and the facilities for turning curves. One section of the original boiler is dispensed with, and is substituted by a frame of suitable length attached to the fire-box, whereon are disposed the water tanks, and the receptacles for fuel, thereby forming a rigid extension in the rear, in the position usually occupied by the tender. This frame and the end of the locomotive, are mounted on a bogie frame, and provided with separate engine power, in addition to the engine at the other end, as described in the specification of the former invention.

[Printed, 2*s*. Drawings.]

A.D. 1865, December 11.—N° 3191.

TOWNSEND, John.—This invention relates to the construction of steam boilers, and consists in the use of two or more large longitudinal tubes, which are placed below the water level, and extend the whole length of the boiler. These tubes communicate with each other by means of transverse pipes; one of the tubes is open to the steam space by means of a pipe, which incliningly extends upwards, with open end, towards the top of the steam space. The other tube supplies the steam through a pipe, which inclines from the other side upwards through the steam space, and opens out through the top of the boiler. By this arrangement all the steam generated in the boiler passes through the tubes, and being much hotter than the water, promotes its circulation and the further generation of steam; any water which may pass into the tubes is vaporized, priming effectually prevented, and the steam thoroughly cleansed before being used for such purposes as printing and dyeing. The invention is described and illustrated as applied to boilers with single and double internal furnaces and flues, and to cylindrical boilers with brick furnaces underneath, and external side flues.

[Printed, 8*d*. Drawing.]

A.D. 1865, December 12.—N° 3213.

STOCKER, Joseph.—This invention relates to steam engines, and consists in converting the rectilineal reciprocating motions of the piston rod, into direct rotary motion, without the intervention of a crank. The inventor states, " In a trunk engine I dispose " the steam cylinder concentric with the shaft, and I fix or form " on the shaft a solid cylinder nearly fitting the internal diameter " of the trunk, it may be the size of the shaft itself. In this " solid piece I cut a kind of cam groove, which for the one half " turn round the solid cylinder is in the form of a thread of a " right-hand screw or incline, while on the other half it is a left- " hand thread, of course returning to the point of departure, and " so forming an endless groove. The incline of this groove on " the half turn equals the length of the stroke of the engine. " A projecting stud furnished with a truck roller is disposed " inside the trunk, which roller is received in the groove or cam, " so that on reciprocating motion being given to the trunk by the " steam piston the thrust in the one direction is transmitted by " the roller to the solid cylinder formed or fixed on the shaft " through the intervention of the groove, which causes it to rotate " a half revolution, the thrust in the opposite direction (the return " stroke) taking effect in the part of the groove oppositely inclined " continues the rotation of the shaft in the same direction. " There may, of course, be two or more steam cylinders placed on " the same shaft which passes through the trunks or hollow piston " rods, and is fitted in suitable bearings for its support and " thrust. The valves and other parts of the engines may be " worked from the shaft by any of the ordinary arrangements."

[Printed, 10*d*. Drawing.]

A.D. 1865, December 13.—N° 3218.

DOERING, Frederick Bernard.—(*A communication from Carl Sachs.*)—This invention relates to steam machinery for boring rock and other mineral. The steam cylinder is fitted between two horizontal shafts, which are fixed in a suitable frame, and form *side supports.* One shaft is screw threaded, whereby the cylinder is moved forward as the work progresses. The end of the piston rod, which passes out of the front end of the cylinder, has the drill or other boring tool affixed to it. The other end of the piston rod, passing out through the back end of the cylinder, carries a crosshead, the ends of which slide in grooves formed in the inner sides of the horizontal shafts. By means of arms actuated by the to-and-fro movements of the cross head, motion is given to a rocking shaft, whereon or to the arms, two sets of tappets are fixed, one set for working the slide valve of the steam cylinder, and the other set for imparting, during the return stroke by means of a pawl and ratchet wheel, rotary motion to the piston rod, and through it to the drill. By means of another pawl and ratchet wheel, the machinery is moved forward according to the rate of penetration by the drill. When required to operate in a fresh place, the apparatus is moved backwards by means of a handle, and when re-established is fixed by means of shores against the roof and floor or sides of the gallery wherein the operation is going on.

[Printed, 2s. 4d. Drawings.]

A.D. 1865, December 13.—N° 3225.

GARDNER, Peter.—(*Provisional protection only.*)—This invention relates to the construction of a rotary steam engine for transmitting power; it may also be used as a rotary pump, and consists of a steam cylinder, through which the main shaft concentrically passes, and whereon a drum is so eccentrically mounted, that one part across its periphery is brought into contact with the internal surface of the cylinder. The ends of the drum which work steam-tight against the inside of the cylinder covers, are made steam-tight by suitable packing, and a longitudinal packing strip is recessed in the surface of the drum along the line of its frictional contact with the cylinder. As the drum revolves, the edge of a resistant slide, longitudinally disposed to slide on a radial line to and from the axis, is kept in contact with the periphery of the drum. The end of this slide moves in radial grooves sunk into the cylinder cover, and it is caused to radially diverge by the eccentricity of the drum, entering a narrow case or recess which radiatingly extends through the inner circumference of the cylinder, and corresponds in depth to the width of the slide, which is packed along the edge in contact with the drum. Steam is admitted into the recess at the back of the slide, which forces the latter convergently towards the axis, during the revolution of that half of the eccentric drum which is included between its major and its minor radius. The steam induction port is situated on one side of the slide, and the exhaust passage on the other, so arranged that the face of the eccentric drum whilst revolving, shall close one part and simultaneously open the other.

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 13.—N° 3226.

BOWEN, Pryce William.—(*Provisional protection only.*)—This invention relating to steam culture, consists in securely mounting upon the engine framing (which is suitably arranged and furnished with a fore carriage) a vertical tubular boiler, the base of which extends considerably below the framing, but is clear of the ground. Upon that part of the lower end of the boiler which depends below the engine framing, the winding shell or drum is fitted, the end of the boiler thereby constituting the vertical axis whereon the drum horizontally revolves, antifriction rollers, to facilitate such rotary movement, being interposed between the shell of the boiler and the inner surface of the winding drum, and also between a supporting flange fixed round the extreme lower end of the boiler, and the lower edge of the shell of the drum; the object of the arrangement being to lower the centre of gravity, and obtain additional platform space. The drum may be suspended at its centre by a pin or bolt.

The engine cylinders may be bolted to the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 14.—N° 3235.

WILSON, John Charles.—This invention relates to steam boilers, and consists in more facile means of generating steam, assisted by the mode employed for keeping up a rapid circulation of water in the boiler. The boiler is contained within an upright cylindrical shell, with central fire-box, which rises to a considerable height, and is covered in by an annular tube plate, the central opening in which communicates with the chimney flue, which passes up through the steam space. Centrally disposed beneath the opening in the tubular plate, there is, suspended on a rod, a hanging mass of fire-brick, which fills the central space, and circumposed in the surrounding annular space, there is an arrangement of bent water tubes, which hang down into the furnace space from the annular tube plate above, in the form of pendent loops or inverted syphons. One end of each bent tube terminates level with the tube plate, and the other end rises through the tube plate and water space into the steam space, terminating above the water level. The central fire-brick mass divergently spreads the flaming gases amongst the pendent tubes, through which upward currents of steam and water are constantly rising into the steam space, supplied by downward currents through the shortest ends of the tubes.

[Printed, 8*d.* Drawing.]

A.D. 1865, December 15.—N° 3247.

WARRINER, George.—This invention relates to apparatus for applying inflammable fluids to steam boiler and other furnaces, to be burnt in conjunction with carbonaceous or other solid fuel. As applied to the furnace of a steam boiler, a pipe connected with the fluid reservoir or supply, is transversely placed under the dead plate beneath the furnace door. Into the side of this tube is fixed a series of small tubes, at intervals corresponding with the interspaces between the fire-bars, so that the free ends of these tubes, where the inflammable fluid burns, point upwards and direct their flames against the burning fuel above. The fire-bars may be made hollow and perforated, so as to afford the means through them for introducing either the fluid, air, steam, or ordinary inflammable gas into the furnace, the ash-pit in all cases being completely closed.

Various plans are devised for applying the invention, the object to be attained being a perfect command over the fire, either to hasten and intensify the heat, or retard the combustion of the fuel, by admitting by means of a valve, more or less of the inflammable fluid, mixed or not with air or steam. In some cases the fluid is introduced by means of pipes disposed in the upper part of the furnace above the fuel, and the means employed for closing the ash-pit, which takes the form of an inverted conical frustum closed by causing the lower end to dip into a pool of water, may be dispensed with.

[Printed, 10*d.* Drawing.]

A.D. 1865, December 18.—N° 3269.

BROOMAN, Richard Archibald.—(*A communication from Julien Belleville.*)—This invention relates to boilers or apparatus for generating steam, and consists of three principal arrangements and combinations of the tubular coil system of construction, respectively applicable as boilers for stationary engines, boilers for locomotive and similar engines, and boilers for marine engines. "These three kinds of inexplosible boilers may be employed for "all purposes." Each description of boiler consists of a separate combined arrangement of tubes, enclosed within brickwork or metal casing containing water space. The tubes, closely packed in horizontal tiers, are united by short bends and communicating pipes; they fill the internal space of the furnace chambers, which vary in form and construction in accordance with the kind of steam engine to which they are applied. The flaming gaseous products of combustion from the fire in the lower part of the furnace rise amongst the tubes, which are severally exposed to the burning current. The arrangements for the feed water, establish a general water level in the sections of the apparatus, and in the upper section, the steam is superheated and dried on its way to the steam chamber, which is superposed above, and furnished with a safety valve. The mode employed for combining the tubes, admits of a free circulation of water through them, and provides means, by the removal of stoppers or plugs, for cleansing them internally. The action of direct currents is interrupted by baffle plates, which cause a general distribution of the fire draughts. All the parts and details are described and illustrated.

[Printed, 3*s*. 8*d*. Drawings.]

A.D. 1865, December 19.—N° 3272.

CARR, JOHN WRIGHT.—This invention relates to producing rotary motion by an apparatus actuated by steam or compressed air, gas, water or other fluid. Concentrically within a fixed cylindrical outer case, is mounted upon a central hollow shaft or axis, an inner or piston cylinder, which is so much less in diameter than the interior of the case, that an annular space is formed between them, the length of the piston cylinder corresponding with the interior length of the case. The piston, which also corresponds in length with the cylinder and case, is fixed across the periphery of the cylinder, so as to divide the annular space, and when the cylinder and shaft revolve, come into steam-tight frictional contact with the internal surface of the case. Two *steam stops* or slides, in length somewhat longer than the inner cylinder, are fitted into recesses diametrally formed in opposite sides of the case. These slides by means of cams or otherwise, are respectively in succession, as the piston is carried round the annular space, suddenly withdrawn into the recesses to allow it to pass, and then again projected across the space the moment afterwards. There are two ports or passages, one on each side of the piston, which answer respectively, according to the direction of motion, either for the induction of the steam, which comes through the hollow axis, or for the exhaust, which is carried off the same way through a separate passage, when lateral apertures in the shaft are, as it revolves, brought into coincidence with the steam and exhaust passages. The steam pressure abuts alternately against the slides in one direction, and against the piston which yields to it in the other direction, whereby rotation of the shaft, whence the power is given off, is obtained. Stuffing boxes and suitable packings are provided.

[Printed, 10*d*. Drawing.]

A.D. 1865, December 19.—N° 3279.

JOHNSON, JOHN HENRY.—(*A communication from David Lister.*)—(*Provisional protection only.*)—This invention relates to the packing of steam pistons, and consists in interposing between the "junk ring" and the "follower," an annular metal shell, grooved to receive an expanding metal packing ring, contrived to prevent the escape of steam at the split joint, and to fit loosely within the annular groove in the shell, so as to leave an annular space between for the expanding action of steam, admitted thereto through openings in the shell. The steam gains access to the interior of the piston, alternately at each end of the cylinder, through a tube which is screwed through the follower into the junk ring. The steam is prevented blowing through the tube by a ball valve provided with two seats, between which the steam opening into the piston is situated, so that the through passage in one or other direction is always closed. The valve is opened alternately at the ends of the cylinder by the pressure of the incoming steam, which by pressing divergently against the interior of the expansible ring "maintains a perfectly tight packing."

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 22.—N° 3308.

CLARK, WILLIAM.—(*A communication from George Bender Whiting and Thomas Fitch Rowland.*)—This invention, relating to

steam engines, " consists, first, in making a cylinder for a reciprocating
" steam engine with a fixed central cylinder trunk for the
" steam chest which communicates with steam and vacuum chambers,
" which are made in one or both of the cylinder heads as the
" case may require, the trunk having steam ports leading into the
" cylinder and fitted with a balanced piston valve, which is
" operated by any of the usual methods, their object being to
" diminish the capacity of the passages leading from the steam
" ports to the cylinder to the least possible space and reduce the
" weight and bulk of the engines, at the same time providing the
" engine with an equilibrium valve; and, secondly, they relate to
" an adjustable eccentric, by which an accurate and reliable cut-off
" and reversing motion for steam valves of every description is
" obtained, which consists in having a gear wheel of suitable
" dimensions fixed on the crank shaft and working into another
" gear wheel of the same pitch and diameter, which is made or
" secured on the circumference of a cylinder which rotates in
" suitable bearings and encloses a system of gear wheels, disc,
" and an adjustable wrist pin in such combination as to enable
" the operator to adjust the latter while the engine is in motion.
" from the position which would cause the valve to follow the
" farthest through any intermediate point of cutting off to that
" position which would reverse the engines, and through the
" intermediate and extreme points of cutting off in the reverse
" direction."

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1865, December 23.—N° 3330.

HOSKOLD, Henry Davis, and BRAIN, William Blanch.
—This invention relates to double-acting pumps, applicable to
mining purposes, feeding steam boilers, to fire-engines, waterworks,
and similar uses. The inventors say, " Our pump consists
" of a ram or plunger enclosed in a working barrel or cylinder;
" near the centre of the cylinder there is a partition dividing its
" length into two chambers. In or on this central partition we
" fit a suffing box and gland, through which the ram works, or
" instead of a stuffing box and gland, we form a simple partition
" or close joint. There is an opening in the side of the barrel
" opposite the gland or partition, closed by a door or lid, making
" both chambers of the barrel air and water-tight with regard to
" each other and to the external atmosphere. We attach the ram

" to a rod, which passes out of the working barrel or cylinder at " one end and is connected to the motive power. The ram is of " sufficient length to reach from the far end of one chamber " through the gland or partition in the centre of the working " barrel or cylinder just into the other chamber, so that when set " in motion by the motive power, the one chamber fills at the " same time that the other discharges; a continuous stream of " water is consequently produced. By this arrangement with the " required number of valves, suction and discharge pipes, we " obtain a double-acting pump, or a combination of two distinct " and separate acting pumps in one."

[Printed, 10*d*. Drawing.]

A.D. 1865, December 23.—N° 3333.

MOORE, Charles Woodward.—(*A communication from Henry Moore.*)—(*Provisional protection only.*)—This invention relates to cocks or valves, which are provided with an elastic seat, and operate similar to an ordinary poppet or check valve and rotating key, working an eccentric in its rotation. The pressure is behind or on the top of the valve, consequently it is always tight. The valve is opened by the rotation of the eccentric or the key below the valve, and it is closed by the fluid pressure. It is stated to be self-adjusting, not liable to wear, and is perfectly tight and durable. " For water heated by the ordinary arrangement of copper boilers " in houses, or any other arrangement not generating high pressure " sure steam, these cocks or valves are as good and durable as " with cold water. For steam cocks or extremely hot water direct " from a high-pressure boiler, they are made with metal seats and " ground in valves."

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 26.—N° 3338.

FISHER, Joshua.—This invention is applicable to the furnaces of steam boilers; also to iron, steel, retort, and other furnaces. It may be readily applied to an ordinary marine boiler " by forming " ing a horizontal platform at or near where the present platform " of fire-bars is now placed, and also by dividing the fire into two " or more parts by means of an air chamber or air chambers passing " sing from front to back," so as to divide the fire-bed into two or more sections.

The sections of the furnace "consist simply of long narrow "chambers, and that with the exception of those on the flank on "each side of every furnace, or between each pair of furnaces, or "within the furnaces, or both, there is or are constructed an air "chamber or chambers running parallel therewith, and having in "some instances one or more air openings through the back. "The said air chambers may be made the whole length of the "furnaces open to the front or back, or both, each furnace chamber "being provided with a series of vertical grated openings on "one or both sides, the bottom of which gratings are on or near "the line of the bed of the fuel and of about the depth of the "fuel, for the admission of air for the combustion of the fuel, "and the ordinary furnace bars and ashpit are, or may be dispensed with." In some cases, in order to ensure more perfect combustion, a number of tubes are introduced through the water spaces to form lateral openings for the admission of air from the air chambers into the furnace in a line above the fuel.

The bars which form the side gratings may be constructed hollow for the purpose of heating feed water for steam boilers The constructive details and arrangements are varied, and modifications required to suit the different kinds of furnaces to which the invention may be applied.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, December 27.—N° 3350.

WHEELER, NORMAN WILLIS.—This invention, relating to "duplex steam engines," consists, 1st, in the employment of two upright cylinders, which actuate a right-angled triangular vibrating beam, connected by links to the two piston rods, which are small hollow trunks. Something approaching to a parallel motion is produced by the manner in which the vibrations of the beam are controlled by two radius rods combined with the motion of the crank, the pin of which centres at the right angle of the beam, one piston working half a stroke in advance of the other. 2, relates to the use of hollow piston rods or small trunks, wherein the links which are jointed to the acute angles of the beam are attached. 3, consists in a peculiar construction of the brasses and straps which embrace the crank pin. The invention is more particularly applicable to marine purposes, but may serve in ordinary positions.

[Printed, 8d. Drawing.]

A.D. 1865, December 27.—N° 3351.

WHEELER, Norman Willis.—The first part of this "invention relates to the use of a static column of water communicating with a reservoir, or with the sea if on shipboard, in "combination with suitable steam heating surface and automatic "discharge, in such a way that it will distil pure water from salt, "or otherwise impure water without requiring attention or manipulation, except at long intervals of time."

The second part "relates to liberating and discharging whatever "unabsorbed air or gas exists in water or other liquids which are "being pumped or otherwise forced under pressure, and consists "in so combining a liquid trap with the discharge pipe of the "force pump, or the vessel containing the liquid and gas, that that "part of the gas as air not intimately mingled or absorbed by the "liquid will be automatically set free."

The following explanation is given in order that the object and utility of the invention be understood. "If we observe what "takes place when a steam engine fitted with a surface condenser "in the usual way is set in motion, we shall find that from leakage "or other causes there has considerable water collected in the "condenser, and is thrown by the first movement of the air "pump into the hot well, and the feed pump receives for a time a "full charge of water at each stroke, but as the feed pump "has usually and necessarily a much greater capacity than that "required to barely supply the boiler when all parts are tight, in "good order, and in perfect adjustment, it will quickly empty the "hot well of its surplus water, and after having been at work a "considerable time there will not be sufficient water condensed "to fill the pump at every stroke, and hence it will receive and "discharge air as well as water, which air will pass into the "boiler, mingle with the steam, and pass with it through the "engine into the condenser, vitiating the vacuum." It is intended to replace the water lost by leakages or otherwise with the freshly distilled water, and thus avoid the difficulties heretofore encountered.

[Printed, 10*d*. Drawing.]

A.D. 1865, December 28.—N° 3353.

BATES, John, BROOKES, Edward, and BROOKES, Edmund William.—*The* first part of this invention relates to metallic pistons, and the second part to lubricating apparatus. The piston packing consists of four rings, which are divergently acted upon by an under ring of flat steel. In transverse section the four rings are wedge-shaped, two, the outermost, "are placed " with their square angles and thin edges outward next the cylin- " der, and the other two or inner rings are placed with their " square angles and thin edges inwards next the spring ring." A space is left between the inner rings, in order that when pressed together by tightening up the piston cover, they may cause the expansion of the outer rings, the whole being kept in position and regulated by the expanding pressure of the innermost ring of steel. The lubricating cup is a closed spherical vessel. The lubricant is admitted through a plug tap at the top. A small hollow two-way regulating cock at the bottom admits steam to the vessel above the lubricant, and permits its egress in regulated quantities drop by drop. An index shows the rate of consumption and the state of the supply. The lubricator is fixed in the usual way.

[Printed, 10*d*. Drawing.]

A.D. 1865, December 29.—N° 3369.

BARCLAY, ANDREW.—This invention relates to steam boilers, and consists in the introduction of suitably curved tubes into the fire-box. The upper ends of the tubes "are fixed into the crown " of the fire-box, their lower ends being bent round and fixed " into the sides; in this way a second communication or series of " commuications is effected between the water situated in the " upper and lower parts of the fire-box; at the same time the " surface of the tubes being exposed to the action of the fire, a " much greater heating or absorbing surface is obtained, from " which immediately follows a proportionate increase in the " amount of steam generated." The tubular arrangement may be modified by disposing the tubes diagonally, curving from the crown plate to the sides of the furnace, which are suitably formed to receive them. The heat from the fire beneath establishes a constant upward circulating current of water through the tubes, which current is supplied from the lower water space. A conically formed water chamber depends centrally from the top of the furnace; a water circulation is established in this chamber by the use of an inner cone. The products of combustion pass from the furnace by means of a number of diverging passages which lead through the surrounding water space and boiler shell, and open into an external flue casing which circumvests the boiler and opens to the chimney. Other modifications are illustrated and described.

[Printed, 10*d*. Drawing.]

A.D. 1865, December 30.—N° 3380.

BECK, RICHARD.—This invention, relating to steam engines, " consists in the employment of a cylinder open at both ends, " and of three pistons, two of which are fixed at a suitable distance apart upon a hollow piston rod, which is slotted between " the pistons. The other piston is placed betwixt the two former " pistons, capable of sliding on the hollow rod, and is fixed " through the slot or slots to another piston rod which is fitted " to slide within the hollow rod. Steam is admitted betwixt two of " these pistons alternately, by which reciprocating motion is given " to both piston rods at the same time." Several modifications are described, including an arrangement of steam engine cylinder composed of three parts bolted end to end together, the central compartment being larger in diameter than those forming the two ends, which are closed by covers.

[Printed, 8*d*. Drawing.]

1866.

A.D. 1866, January 1.—N° 5.

PRIDEAUX, THOMAS.—The object sought to be obtained by this invention, which relates to furnaces, is " not only to ensure " rapid and complete ignition and combustion of the fuel em- " ployed, but also consumption of the smoke generated by such " combustion." The invention is described as applied to a steam boiler, and is generally applicable to furnaces. The front of the furnace is built up or enclosed by air-tight doors. The atmosphere necessary to support combustion is admitted through the open ends of channels or pipes which are formed in, or built into the side walls, and communicate with a narrow cavity or chamber surrounding the furnace, to which it finds admission through a number of small converging channels, which may be formed by using perforated bricks; these channels lead from the cavity into the furnace above the grate bars, and through them the requisite quantity of air passes from the opposite sides upon and over the burning fuel, supplying the elements of combustion thereto, and to the smoke which is evolved. If necessary a fan may be used to hasten the air current through the pipes or channels.

[Printed, 8*d*. Drawing.]

A.D. 1866, January 3.—N° 25.

BLACKBURN, Bewicke.—This invention relating to furnaces, has for its object the economical consumption of the fuel employed, and the perfect combustion of the inflammable gases and smoke evolved. The object is effected by causing a return of the inflammable gases and smoke, which are directed into the furnace a second time, and pass therein through the fire-bars and incandescent bed of burning fuel, the air necessary to support combustion being primarily admitted through a valve to the ash-pit. The invention is exhibited and described as applied to steam boilers of different construction, to which, fitted to a curved part of the exit flue, is an aspirating apparatus, consisting of a piston or movable diaphragm, the reciprocating action of which in one direction of its movement, draws the external air into the ash-pit and furnace, and during its opposite direction of motion, forces the return of the gases and smoke through a return flue, back to the ash-pit, the admission air valve to which, is alternately opened and closed by the apparatus, which is mounted on a rocking shaft actuated by a crank arm, motion being communicated from the engine by means of bands and pulleys. When two furnaces are employed, or when the furnace is divided into compartments, suitable flue passages and valves are arranged to be opened and closed by turns, in order that the inflammable gases and smoke evolved in the furnace or compartment most recently fed with fuel, shall pass continuously through the incandescent fuel of the previously fed furnace or compartment; in such cases the respiratory apparatus is dispensed with.

[Printed, 10*d*. Drawing.]

A.D. 1866, January 4.—N° 29.

HISCOCKS, James.— (*Provisional protection only.*) — This *invention relates* to the construction of furnaces, and the com*bustion of fuel,* and consists, according to one modification in applied to an ordinary Cornish boiler, in constructing side by side in front of the boiler, two brick-work furnaces, which by means of a flap valve, are made to communicate alternately with the central boiler flue. The two fires are fed by turns with fresh fuel, so that one or other of the fires is giving off smoke, whilst the other is clear and incandescent. Between the two furnaces there is a downward passage, through which the smoky products from the last fed fire are, by means of suitable damper valves, directed into the closed ash-pit of the other furnace, where, passing up through the grate bars amongst the incandescent fuel, they are consumed, the heat from both furnaces thereby combining and passing alternately from either one or other fire into the central flue of the boiler. The invention includes an arrangement for heating the atmosphere which supports combustion, by directing it through a series of heating chambers and tubes in connection with the flue passages, a fan being used to force on the air current.

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 5.—N° 44.

WINTER, William.—(*Letters Patent void for want of Final Specification.*)—This invention of improvements in locomotive, stationary, and marine engines, " relates to the joints of con-
" necting rods, side links, slide blocks, or other joints and mov-
" able connections of such engines, and consists in applying one
" or two conical bushes on and betwixt the crank pin or other
" pin and the said rod, link, block, or connection, which bushes
" are adjustable by set screws or other suitable means." It is stated that a " saving is effected in the cost of fitting and in the
" wear and tear."

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 5.—N° 45.

NEWTON, Alfred Vincent.—(*A communication from Joseph Napoleon Bonaparte Bond and William Ritchie.*)—" This inven-
" tion relates to the employment of a pipe made of brass or some
" other material capable of expanding under the influence of
" heat, which pipe will, through its expansion, open a communi-
" cation between the water and steam space of the boiler to be

" supplied with water and the top and bottom of a water supply " tank situated above the boiler, and thus effect the discharge of " water from the tank into the boiler when the water in the " boiler has sunk below the mean water line. The expansible " pipe is exposed to the direct action of the steam, and thereby " caused to buckle up or to lengthen, and by this motion a cock " is opened and steam admitted to the upper part of the tank, " causing the water contained therein to sink down into the " boiler, and when the water rises above the mean water line the " expansible pipe cools off and recedes to its original position, " and the further supply of water to the boiler is stopped."

[Printed, 6*d*. Drawing.]

A.D. 1866, January 6.—N° 49.

BEATTIE, William George.—This invention relating to " apparatus for lubricating purposes," consists of an upright cylindrical or other shaped vessel, externally furnished with a glass tube which communicates top and bottom with the interior, so that the level of the lubricant, as seen in the glass shall indicate the quantity contained in the vessel, which is supported by a neck, through which is the regulating plug or cock. This plug contains several ways or passages. The lubricant is poured into a cup which is formed on the top of the vessel, and communicates by a downward passage with the admission opening in the plug, which when brought into coincidence therewith, admits the inward flow of the lubricant, at the same time that a small air passage, leading from the interior of the vessel to the plug is opened for the emission of air. When the plug is turned to the feeding or lubricating position, numerous small passages therethrough are more or less brought into coincidence on one side of the plug with the feeding passage from the vessel, and on the opposite side, with the outflow passage leading to the machinery or part to be lubricated, so that when the plug of the cock is open to receive liquid into the vessel, the air emission passage is also open, and the lubricating outlet closed; and when the passage admitting the lubricant is closed, the air passage is also closed, and the lubricating outlet more or less open. Modifications similar in principle are described.

[Printed, 10d. Drawing.]

A.D. 1866, January 8.—N° 58.

PENRICE, Herbert Newton.—This invention relates to machinery, actuated by and combined with power, for forming tunnels and galleries in rocks. The operating part of the machinery consists of a disc or circular frame, the face of which is furnished with a series of projecting tools or cutters, disposed in concentric circles or otherwise. Those tools which project beyond the others, produce circular grooves in the face of the rock, whilst the shorter tools break up the intermediate parts. The disc is fixed to the end of the piston rod of a main horizontal cylinder, which is suitably mounted on the foundation frame of the apparatus. The stroke of the main piston is very short and rapid, and by means of a worm wheel and worm, the piston, rod, and disc, are caused to partly rotate between each successive advance of the disc and blow of the tools. The whole area of the back of the piston is acted upon by the steam or other pressure for effecting the outward or working stroke, and for the return stroke, by the steam pressure in the small annular space formed in front of the piston round the strong piston rod, which is of necessity large in diameter. To this space the steam is always admitted. The valve gear of the main cylinder is operated by a small inverted cylinder and engine, fixed at the back of the main cylinder. The piston rod of the small cylinder also actuates the step-by-step and other motions about the machine, the fore part of which is supported on adjustable sledges, and the hind part on two moving or driving wheels, which are actuated by worm gearing. The axles of these wheels are so placed, as to bring their peripheries to bear incliningly at an angle of about 45° against the sides of the tunnel. Another wheel, directly over the space between the two former wheels, is by the aid of a strong volute spring, pressed against the roof, whereby the biting power of the two moving wheels is considerably increased. By means of an endless chain, furnished with a series of rakes and scrapers, the broken stone, debris, and slush, are drawn from the front towards the back of the machine for removal.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, January 10.—N° 80.

WILSON, Edward Brown.—(*Provisional protection only*).—This invention, relating to furnaces applicable to steam boilers, puddling iron, heating and other purposes, consists in the use of a metal plate, to form the bottom of the furnace and support the bed of burning fuel: a short distance beneath this plate there is another, the two plates being united at the sides so as to form a shallow duct or passage, through which, passing between the plates from back to front, the atmosphere is admitted, passing upwards into a chamber, and thence through a perforated plate of metal or slab of fire-brick, the air current is directed into the front of the bed of incandescent fuel, a suitable inclination being given to the plates and parts, to ensure the gradual shifting and removal of the ash. The fuel is fed at the top of the furnace through an air-tight door, and in the case of boilers, the passage between the plates is sometimes closed and made to communicate with the water space; in some arrangements, an air passage is formed over the furnace, or round the foot of the chimney. Other devices in connection with the invention are resorted to.

[Printed, 4d. No Drawings.]

A.D. 1866, January 12.—N° 102. (* *)

WALSH, William John.—" Improvements in cocks, taps, " and valves."

At one end of a grooved or triangular spindle is a knob to which pressure is applied to open the tap. This spindle is fitted in a barrel, having a valve at its upper and lower ends. Between these valves is the aperture for the outflow pipe. To the bottom of the spindle is fitted a small valve which is opened by pressing on the above-mentioned knob. When this small valve is opened, the fluid flows along the sides or the grooves in the spindle to the upper side of the valve at the top of the barrel, which being thereby pressed down, opens the lower valve and thus permits of the escape of the fluid. When pressure is removed from the knob, the flow of the fluid is checked.

[Printed, 6d. Drawing.]

A.D. 1866, January 13.—N° 115.

WHEELER, Norman Willis. — This is an invention of " apparatus for condensing steam and other vapours and for " refrigerating fluids," which consists 1st. " in the directing of " the refrigerating fluids into refrigerating vessels through pas- " sages so constructed and so related to the other parts as to

" develope and maintain centrifugal force, tending to throw the " densest particles continually against the heated surfaces and to " spread out the cooling fluid in a thin sheet actively circulating " thereon, having the central space comparatively empty."

2nd. " The so directing of the vapor or other fluid to be cooled " into condensing or refrigerating vessels through passages so " constructed and so related to the other parts that the heated " fluid will not impinge primarily against the principal refri-" gerating surface, but will impinge upon other enclosing surfaces " in such a way as to develope and maintain centrifugal force, " tending to throw the densest particles, water, oil, etc., away " from the cooling surfaces, and cause the lightest, hottest, or " most volatile particles to be all the time presented to the cool " surface."

3rd. " consists in preventing the filling of the interior of such " refrigerating vessels with liquid by the forcing in of air or " other permanent gas."

The apparatus consists of a series of closed vertical cylinders of thin sheet metal, so enclosed by other cylinders, as to form a series of narrow annular spaces. The vapour or fluid to be condensed or refrigerated, circulates or flows round these annular spaces, and the cooling or circulating water, forced by suitable pumps up a vertical pipe in each cylinder, is projected from curved radiating lateral channels at the top, in such a way against the internal surface of the thin metal cylinders, as to cause it while descending therein, to impinge against the metallic surface, and maintain the circumfluent motion imparted to it by the force with which it leaves the several outlets.

[Printed, 8*d*. Drawing.]

A.D. 1866, January 15.—N° 127. (* *)

COMFIELD, THOMAS, the younger.—(*Provisional protection not allowed.*)—" Stopping and preventing slip from wet rails of loco-" motives and railway trains, and stopping carriages generally, " and equalising force without fly wheels."

By an " arrangement of valves " in connection with the " cylin-" ders of locomotives," and (what is named) " the momentum " steam chest," the pistons " reverse the nature and effect of their " action without reversing the direction of their motion " this reversed action is maintained " at the expense " of the momentum *of the engine* " and its load brings the same to a standstill."

By an arrangement in the permanent way and of a galvanic current the inventor prevents "the slipping of those wheels "upon whose revolution the action of the retarding piston "depends." "This reversed action" causes "the steam re-"ceived from boiler" to be "returned thereto through the "momentum steam chest."

By an "arrangement of conducting pipes containing water "connected with a double-acting cylinder, and having taps" the train may be stopped.

By an "arrangement of vulcanized india-rubber, an absobent "material, means for drying same, and heated air," the inventor prevents the slip which occurs from wet rails.

By having "an equalizing cylinder acting substantially as the "driving cylinder herein described, and whose power of equal-"izing speed exceeds the extremes of the variations to be "equalized" the inventor dispenses "with the use of fly "wheels."

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 15.—N° 139.

MORIARTY, Cornelius.—This invention relating to brushes for cleaning the tubes of steam boilers, is supplementary to a prior invention by this patentee, for which Letters Patent, bearing date June 30th, 1856, No. 1534, were granted to him, and which consists in placing the bristles or fine wire, or material of which the brushing part of the instrument is composed, transversely between two metallic strips or bands, so that they project a uniform distance on each side; when the bands are twisted together they close upon the material and so form a helical or spiral brush.

The object of the present invention is the more perfectly securing the bristles or material between the bands or foundation, and for this purpose two or more metal wires are substituted for each band, and interposed on each side between these wires and the bristles, is a thin band or tape of india-rubber or other similar elastic substance, which when compressed by the twisting of the wires, is so pressed upon and squeezed amongst the bristles or
ial, that no loosening takes place when the brush is worked
ro in the tube. The ends of the body wires are firmly
n suitable caps before the twisting process is performed.

d, 8*d*. Drawing.]

A.D. 1866, January 16.—N° 148.

CHERRY, Richard, CROSSLEY, Edwin, and BOWER, William.—The object of this invention which relates to the construction of steam boilers and similar vessels, consists in so arranging the longitudinal and transverse jointing of the plates, that the ordinary continuous line of joints in either one or other direction is broken at each plate. To effect this, a portion of two of the diagonally opposite corners of each plate is removed, which raises each end joint a step above the preceding, and breaks the longitudinal joints in the same manner. The corners which are removed, may be taken off either straight at an angle of about 45°, or curved to the arc of a circle; if the latter form be adopted, the curve at one corner must be convex, to correspond with a concave curve at the corner diagonally opposite. When rivetted together, each plate forms an irregular hexangular section of the superficial area of the boiler shell. The invention is also applicable to the construction of iron plated ships.

[Printed, 10*d*. Drawing.]

A.D. 1866, January 17.—N° 163.

NORTON, James Lee, and BÜNGER, Frederic Ludovicus Henri William.—(*Provisional protection only.*)—This is an invention of apparatus for discharging the water of condensed steam. The form of the vessel which receives the water is not important, but those which are spherical and made in two halves are preferred. Opening into the upper half there is an inlet passage, the other end of which communicates with the steam chamber or apparatus wherein the steam is employed. A vertical rod is passed into the spherical vessel through a stuffing box at the top, and descends therein to a depth which can by suitable means be regulated. Suspended to the lower end of the rod within the spherical vessel, there is a cylindrical vessel filled with water, the top and bottom of which are made of concentrically corrugated flexible sheet metal. The lower end of the rod is attached to the centre of the flexible top, and the upper end of the spindle of a valve which closes an outflow pipe at bottom, is attached to the centre of the flexible bottom, and so long as the cylindrical vessel is surrounded by steam, the volume of the water therein *is expanded*, and the outflow valve below remains closed;

but as the water of the condensed steam accumulates in the spherical vessel, the water in the cylindrical vessel is cooled, and consequently so much lessened in volume as to cause the raising of the outflow valve and permit the escape of the water. The Specification of a Patent, granted to Frederic Ludovicus Henri William Bünger, bearing date October 27th, 1862, No. 2890, is referred to.

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 18.—N° 166.

ADAMSON, Daniel.—This invention relates to vertical steam boilers, and to a mode of combining two or more such boilers for marine and other purposes. Each boiler contains a furnace and ash-pit within a cylindrical shell. The upper part contains a group of vertical tubes, which pass up from the top of the furnace through the water and steam spaces to the top of the boiler, which constitutes the upper tube plate, the lower ends of the tubes being set into the roof of the furnace, which forms the lower tube plate. Several modifications are shown and described. Some of the vertical shells are of large diameter, and contain four furnaces each distinct from the others, with separate fire-doors. Others contain a single furnace, diametrally bisected by a narrow water space. Two or more boilers are combined and surmounted by a combustion chamber, which receives the products of combustion from the tubes of all the sections, whence they are discharged into one chimney. To prevent corrosion of the tubes in the steam space, the upper ends of the tubes are coated with an enamel of glass or other vitreous substance. Horizontal baffle plates are used in each section to prevent the displacement of the water. A perforated annular tube is employed in each to distribute the feed water, and perforated annular blow-off tubes are furnished with V-troughs to collect deposited matter. One steam dome is common to all the boilers in a combination, and by means of stop cocks and dampers, the working of any one boiler in a series may be discontinued for the purpose of cleaning or repairs.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, January 18.—N° 167.

WORTH, Henry.—(*Provisional protection only.*)—This *tion relates to* a mode of lubricating those frictional surfaces of steam engines which are subject to the pressure of the steam, and consists, by means of a gradual accumulation of the water of condensed steam within the vessel which contains the lubricant and upon the surface of which water the lubricant naturally floats, in causing the lubricant to overflow in regulated quantities into the pipes or channels through which it is supplied to the surfaces. When employed to lubricate the steam cylinder and other parts of an engine, the lubricating vessel is attached to the cylinder cover, and surmounted by a small condensing chamber. "From " the interior of the cylinder, through the cover, a tube extends " upwards through the large vessel and terminates in the con- " densing vessel, the lower end of this tube being branched out " and placed in close proximity to the part to be lubricated (say " the piston rod) and this tube is enclosed in another tube or " shield and the space between is filled with any non-conducting " material so as to prevent the passage of the steam up the inner " tube, heating the lubricant too much, thus the steam passes " at every stroke up the tube into the condensing vessel, on the " sides of which the water accumulates, and as it falls into the " lubricant it raises it constantly and gradually, so that it is " intermittently but continually overflowing by drops into the " lubricant supply tube, whence at each stroke the pressure of " steam forces it on to the part to be lubricated."

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 18.—N° 168.

SPENCER, George.—This invention relates to cylindrical and other formed blocks of india-rubber suitable for buffers, draw, and bearing springs, to act alone or in combination with steel springs for railway engines, trucks, and carriages, or as body springs, and springs for other purposes. It consists :—

1st. In the use of cup plates for confining the lateral expansion of cylindrical blocks of vulcanized india-rubber prepared for use as springs, such cup plates having concentric annular projections which fit into corresponding annular recesses moulded in the cylindrical block spring; also for the same purpose, and to limit the amount of elastic action, recesses are formed round the cylindrical block to receive metallic rings. When cup plates and a series of blocks are employed to form a spring, metal plates are placed at the ends. The blocks may be made solid, or with a central hole to receive a rod or spindle. Other plans are devised.

2nd. Consists in the use of metal wires embedded in such cylindrical block springs in combination with the mode of confining the lateral expansion and of limiting the extent of action.

3rd. Combining such confining rings as are described in Coleman's patent, dated June 28, 1852, No. 14,193, with the use of metal wires embedded in cylindrical india-rubber block springs to increase their resisting power, as described by S. Moulton in the specification of his patent, dated January 10, 1861, No. 62.

George Attock's patent, dated August 31, 1863, No. 2145, is referred to.

[Printed, 10*d.* Drawing.]

A.D. 1866, January 19.—N° 175. (* *)

SHEKLETON, James, and GIBSON, John William.—" Improvements in pumping engines for feeding and forcing " fluids."

This invention consists of a cylinder in which a piston is fitted to move freely; this piston is constructed with a proportionately large piston rod on one side (passing through a stuffing box or collar in the cylinder cover), so that there is a difference of area on opposite sides of the piston, and if an equal pressure per unit of area be applied simultaneously on each side, the piston will move in the direction of the side to which the rod is attached. To obtain reciprocating motion the piston or rod may be weighted or it may be attached to a spring or fly wheel; or when steam is used in forcing by a vacuum, which can be formed by surrounding the cylinder with an outer casing filled with a circulating fluid of low temperature, or by pumping through this casing the fluid to be forced. The reciprocating motion may be regulated by a valve or cock worked off by the piston rod, and the length of the stroke varied at pleasure, and the fluid being raised or forced is drawn in and expelled through ordinary inlet and outlet valves.

[Printed, 10*d.* Drawing.]

A.D. 1866, January 19.—N° 177.

CLARK, Richard.—(*Provisional protection only.*)—This invention relates to the use of coal gas combined with a forced supply of atmospheric air as a heating medium for generating steam in the bodies of locomotive and other steam engines. The inventor says, "In the heating of steam boilers I use ordinary coal gas, " which may be contained in a suitable receptacle in the tender of " a locomotive engine or other convenient position to the boiler " to be acted upon. Between the gasometer and gas burner I " introduce, by means of a supply pipe and pump, atmospheric " air, the supply of which must be regulated by the pressure of " gas and the quantity of heating surface to be acted upon by " such forced supply of air acting in the nature or manner of a " blast furnace."

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 20.—N° 194.

HALL, William King.—This invention, relating to the construction of steam boilers, consists in the employment of inverted conical water tubes, vertically disposed within the furnace. The upper ends of these tubes are secured to the roof of the furnace; they diminish in diameter towards the fire-bed, and then assume a uniform size, passing to below the grate bars into the ash-pit, where they are secured to the inner casing, between which and the outer shell there is a surrounding water space. Within each tube, which forms a direct vertical communication between the lowest and uppermost water space, there is a constantly ascending current when the boiler is at work. The flaming products of combustion, which rise from the fire and play amongst the tubes, are afterwards gathered into a flue, which passes in an inclined direction through the steam space to the uptake and chimney. Those portions of the tubes which pass through the fire-bed are protected by fire-brick; the upper part of the boiler shell which covers the steam space is supported by forked vertical stays, and horizontal stays are introduced where required. The form of the boiler may be varied.

[Printed, 10*d*. Drawings.]

A.D. 1866, January 22.—N° 197.

ALLEN, Samuel Finton.—This invention of "feed water " heaters for locomotives" " relates to the employment of a portion " of the exhaust steam for the purpose of transmitting heat " *therefrom to the feed* water for the boiler, and consists in so

" constructing and arranging a tubular or otheir suitable heater
" with pipes, connections, stop valves, and other attachments,
" that a portion of the steam shall be interrupted in its course
" through each of the exhaust pipes by a lip or projection extending
" inward at an oblique angle, and steam shall be thereby
" diverted into additional pipes capable of being removed at will
" by disconnecting a suitable yoke, and the steam shall be led
" through these additional pipes into a common pipe leading to
" the heater and controlled by an adjustable valve, so as to heat
" the feed water, and avoid either seriously obstructing the escape
" of the exhaust steam or discharging an excess of steam through
" the heater."

[Printed, 8*d.* Drawing.]

A.D. 1866, January 23.—N° 214.

GEDGE, William Edward.—(*A communication from Louis François Désiré Dufour.*)—(*Provisional protection only.*)—This invention relates to a steam generator for steam engines; the advantages sought being economy of fuel and security from
" the dangers of explosion. An envelope of bricks or fire-clay
" surrounds the boiler, which is placed vertically on an ordinary
" fire-place. The heat of the fire-place acts first on the
" bottom of the said boiler, then passes around it in a space
" left between it and the brick or fire-clay envelope, and
" returns above in a chamber, from whence it descends vertically
" in the centre of the boiler by a large tube which leads
" to another lower chamber. The caloric and the smoke after
" diffusing themselves in this chamber escape by a somewhat
" considerable quantity of vertical tubes which lead from this
" chamber to a conduit placed at the upper part of the boiler,
" which carries the smoke into the chimney. In addition to
" the principal arrangement above described the water-feeding
" cistern is made to pass in the conduit above mentioned, which
" further utilizes the caloric that it may contain. The waste
" steam is also used to heat the feed water by causing it to pass
" into a worm placed in the feeding cistern, which further
" receives the products of the condensation which takes place in
" this journey. Lastly, on the top of the boiler are placed two
" safety valves opening in two pipes, which preserve them from
" all contact and secure their proper working."

[*Printed*, 4*d.* No Drawings.]

A.D. 1866, January 23.—N° 218.

PRIDEAUX, Thomas.—This invention, relating to the heating of feed water for steam boilers, and for other purposes, consists in the use of a closed chamber or vessel, into which the exhaust or waste steam from a high-pressure engine, from a steam hammer or other machine is conducted, or, the chamber may be interposed in the passage between a condensing engine and the condenser. Within the chamber is disposed a coil or series of tubes, through which the feed water is made to pass. The tubes are heated by the steam which is passing through the chamber, and by conduction the water obtains and carries off the heat which is constantly passing through the metal of which the tubes are composed. The chamber is furnished with suitable outlets, so that no obstruction is offered to the passing steam. When convenient, it is proposed to place the heating apparatus upon the boiler.

[Printed, 10*d*. Drawing.]

A.D. 1866, January 23.—N° 226.

HOWARD, James, and BOUSFIELD, Edward Tenney.—This invention relates to the construction of water tube steam generators, whereby (it is stated) tight joints, great structural strength, extended heating surface, and protection to the upper part of the tubes, is ensured at a comparatively small cost. The generator consists of sections, formed respectively of a series of tubes, and the requisite number of these sections are combined to serve the requirements of the engine, which the generator is intended to supply with steam. "Each section is formed with a " row of parallel tubes connected at top and bottom with trans- " verse tubes, which are formed with sockets to receive the ends " of the parallel tubes, and connected to each transverse tube at " right angles thereto or cast therewith is a short tube flanged at " its ends, by which means the sections are coupled up at top " and bottom. The sections thus formed are placed in a heating " chamber, into which the flame and heated gases flow from the " fire-place over the furnace bridge, and they are set up vertically " and transversely of the chamber. The vertical tubes are con- " nected to their transverse horizontal tubes by means of screw " coupling rods, which pass through the latter and down the " centre of the vertical tubes, and are secured by nuts at their

" extremities; and to allow for the unequal contraction and " expansion of the different parts the vertical tubes bed upon " vulcanized india-rubber rings inserted in the sockets of the " transverse pipes. In coupling together the sections the short " flanged tubes before mentioned form longitudinal tubes, and it " is from one or other of the lower of these tubes that water is " supplied to the boiler, while from one or other of the upper " tubes the steam is taken off. To prevent the burning of the " upper parts of the sections which form the steam space and super-" heater these parts are protected from the run of the flame above " the water line by a series of screens or other means, but which " will allow the heated gases to circulate to the desired extent " around the upper part of the sections for the purpose of super-" heating the steam."

[Printed, 10*d*. Drawing.]

A.D. 1866, January 23.—N° 228.

SILVESTER, Mark.—This invention relates to a "compound " for removing and preventing incrustation in steam boilers." The approximate quantities of the ingredients compounded consist of, 4 parts by weight of charcoal or carbon in powder, 2 parts by weight of carbonate of potash, 8 parts by weight of carbonate of soda, and 1 part by weight of muriate of ammonia. When mixed together they may be formed into cakes, or used in the powdered state. The compound is mixed in suitable quantities with the feed water, and, it is stated, will cause the breaking up of incrustation already formed, and prevent the cohesion of new deposit, which may be blown out of the boiler in a state of mud.

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 26.—N° 265.

SHERWOOD, Henry.—This invention relates primarily to so treating mixed fibrous substances, such as rags, cuttings, waste fabrics, and yarns containing animal and vegetable fibres, that the fibres are disintegrated without injury, the vegetable portion being prepared and made available as pulp to be used in the manufacture of paper, and the animal fibres by the after processes are prepared for felting purposes, and the manufacture of yarns and fabrics.

The apparatus employed for preparing the chemical agents (viz.) sulphuric anhydride or chlorohydric, which are used in a gaseous state, consists chiefly of a furnace, which from the character of its products and effects, producing no smoke, and being capable of consuming any carbonaceous substance, wet peat, culm, or spent tar, is applied with economy for generating steam, for producing inflammable gases, and for smelting and refining metals.

This furnace is constructed on the down-draught principle of "Cuyler." The air required to support combustion is supplied through a tube, whereby it "attains a determinate current and "becomes a powerful draught through the fuel. The usual "products of the furnace are carbonic oxide and nitrogen. "Around and parallel with the sides of the furnace are flues "conveying air, which heats in its course, and (when admitted "for that purpose) mingles with the carbonic oxide and consumes "it into carbonic anhydride. If I wish to add hydrogen I drop "water on the surface of the fuel. If anhydrous chlorohydric "gas I drop aqueous chlorohydric acid. I can also set a retort "beyond or within the furnace for the production of anhydrous "chlorohydric gas by the same process as from the chlorides. "When I need an anhydride, as sulphuric, I can obtain it by "distillation (in a small reverberatory furnace placed beyond the "furnace) of calcined sulphate of iron or of fused acid sulphate "of soda."

The other parts of the invention relate to the apparatus employed for disaggregating the vegetable fibres, for bleaching them and regenerating their strength, and to apparatus for loosening and separating the animal fibres, and preparing them for carding and other processes.

[Printed, 10*d*. Drawing.]

A.D. 1866, January 29.—N° 279.

ARTHUR, ALFRED, and DAVIS, BENJAMIN. — (*Provisional protection only.*)—This invention consists of rotating apparatus adapted for raising water or fluids, extinguishing fire, measuring, propelling and improving water wheels; it is also applicable to rotary engines impelled by steam. It comprises—

1st. "A circular or elliptical drum, with another drum of a "circular form *turning* on an axle fixed therein, and so placed as

" that one of its sides shall touch the interior part of the periphery " of the exterior or larger drum. Through this interior drum " and axle from four to ten or more holes are pierced, and sliding " bars are inserted in these holes which touch the periphery of " the larger drum on both of its sides; on to these are attached " straight pieces of metal or boxes, which occupy one half of the " space between the smaller drum and the larger one; four, six, " or eight pieces of metal are fixed to the smaller drum, on which " these rods and pieces of metal slide; these rods and boxes " when the smaller drum is turned cause a constant vacuum, " whereby water is raised in a continuous stream. This part of " the engine can be used as a pump fire engine as occasion may " require, and being constructed of larger dimensions forms a " mill wheel of great power."

2nd. " Consists of a circular fixed drum with a hollow cylinder " fixed to one of its sides passing through to the other side, and " open on the upper side of its periphery; on this another hollow " cylinder revolves open at four or more parts of its periphery; " between these openings pieces of metal are fixed and made to " fit the exterior drum closely. In revolving water is now raised " in a continuous stream, and to prevent its being carried round " by centrifugal force a donkey pump is attached, the working " of which causes the water to discharge itself rapidly through " the hollow cylinder fixed in the centre of the large fixed " drum."

The other parts of the invention relate to apparatus of a similar character.

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 29.—N° 281.

ORR, John.—This invention of " improvements in steam " engines," relates to the mode employed for actuating the air pump, and to disposing it in an inclined position, so as to obtain the advantages of the " good vacuum " of the vertical arrangement, combined with the direct mode of working in a horizontal arrangement. The position of the air-pump cylinder is diagonal to the main cylinder, and motion is given to its connecting rod, by coupling it either to the upper end or cross head of the main piston rod, or to its lower end, which works out for that purpose through the bottom of the main cylinder. The air pump is placed in

" such a position, and the connecting rod made of such a length
" that the latter shall at either end stroke of the engine, form but
" a small angle with the centre line of the air pump on each side
" of the same. If the air pump is provided with a plunger piston
" the connecting rod is connected directly to the bottom of
" the latter, while if the air pump is provided with an ordinary
" piston and piston rod, the connecting rod is hinged to the end
" of the latter, which is provided with a cross head working in
" inclined guides."

[Printed, 8*d*. Drawing.]

A.D. 1866, January 29.—N° 286.

ROBERTSON, James—This invention relates to various arrangements of steam and other machinery and apparatus for excavating, cutting, sinking, and dredging water courses, canals, docks, roadways, foundations, and similar works, and to raising and recovering valuable material from under water, by means of ascending and descending currents of water or air impelled at a high speed by centrifugal acting pumps, fans, or other suitable exhausting and forcing apparatus. Many modifications and manifold arrangements of apparatus, devised for performing various kinds of operations, are exhibited and described, including amongst other things, dredging the bottom of waters from a hopper boat carrying steam power and machinery, forming embankments and canals, cleaning streets and ways by the force of jets of steam, and employing a long horizontal supporting open-ended cylinder for carrying the apparatus over soft or unmade ground during its working operations. The material raised or shifted may be loaded into trucks, which work in the cylinder and discharge their contents at either end.

" The currents of water or air to be used for acting upon and
" raising . . . the material . . . may be produced by almost
" any of the forcing and lifting pumps . . . at present in use for
" the raising of water or the producing of forced currents of
" fluid generally, ... or by the gravitation of collected
" water at a higher level than that to which the currents and
" substances to be acted upon have to be raised, or by small jets
" or streams of high-pressed steam, or forced streams of water or
" air inducted into the conduits or pipes containing or conducting
" the column of water or air raising or conveying the heavy

" matters and dust along with it, and so as to give it either the
" initial force or motion or an induced supplementary force.
" These fluid currents so forced at a high speed are conducted
" in an endless or returning stream down or along a descending
" or induction close pipe or conduit, and through past an open
" port or channel forming a continuation of the conducting pipe
" or pipes, at the lowest part or level from which the material
" to be acted upon has to be raised or conducted and finally
" forced or drawn up or along the eduction or outlet close pipe
" or pipes and out at an open free end formed at the highest level
" to which the materials have to be raised, and are there delivered
" or discharged along with the currents. The materials . . . .
" are brought in contact with these forced . . . . . . continuous
" currents . . . . through the open nozzle piece, jet box, or
" ' mouth-piece ' formed at or near the lowest part or level of the
" conducting pipes in such a manner as to be carried forward by
" and discharged along with the currents, and these mouth-pieces
" have to be variously formed or adapted to suit the nature and
" position of the material to be acted upon or raised by the
" currents of water or air."

In some cases exhaust currents are used induced by steam only.

[Printed, 6*s*. Drawings.]

A.D. 1866, January 30.—N° 289. (* *)

SHAW, Henry. — (*Provisional protection not allowed.*) —
" Improvements in the means and apparatus of communicating
" motion or power from the engine of a train to any part of the
" train."

" From the part of the train at which it is desired that a motion
" or power should be made or exerted, a steam pipe is laid to the
" engine boiler, with flexible or telescopically extensible joints
" therein for passing from carriage to carriage; the steam can be
" then applied to make or exert the motion or power that is
" desired by using a cylinder and piston fed by steam from the
" pipe."

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 30.—N° 291.

TONGUE, **John Garrett.**—(*A communication from Edouard ais.*)—(*Provisional* protection only.)—This invention relates to obtaining motive power by the agency of hot air or steam, so combined with inflammable gas, that whilst in a state of combustion, light may be obtained therefrom. The summary of the principles evolved are stated to be :—" 1st, to take from the " atmosphere air as cold as possible. 2nd, to compress it by force " pumps into a close space divided by fillets or thin metal plates. " 3rd, heating it by the most economical means that science has " placed at our command. 4th, conducting it thus heated, that " is to say, expanded, into conducting tubes to one or more " working cylinders. 5th, utilizing the heat at its exit (from the " cylinders), first, by making it exclusively feed the furnace, that " is to say, to make it furnish the quantity of air required by the " working and for the proper combustion of the gas, and then in " utilizing the rest according to the requirements of the purpose " to which it is applied." On board ship this residuum of heat may be utilized for the purposes of cooking and distilling sea water, and on railways, after feeding the furnace, it may be made to heat the passenger carriages. For giving light, the combustion of the inflammable gases combined with the compressed air, is made to take place in a transparent cylinder, into which the gas is by means of a pump forced through a pipe, the end of which terminates within the cylinder, and is pierced with numerous holes to ensure a proper distribution and commingling of the gas with the passing current of heated air.

[Printed, 1*s*. Drawings.]

A.D. 1866, January 31.—N° 310.

WOODWARD, William, and WOODWARD, John.—This invention, relating to steam boilers and generators, consists in dispensing with the ordinary grate bars, with a view to economy in the production of steam. In most boilers no ash-pit is required, the fire being made upon the metal plates which form the bottom of the furnace, and which is surrounded with water space, so that the plates only intervene between the water and the body of the fire. Tubular air passages, through the water space beneath the furnace, admit the air necessary to support the combustion of the fuel, the current of the air being hastened by means of a jet or jets of steam, emitted from the nozzle of a pipe or pipes placed in a contracted part of the uptake or flue, pointing towards *the chimney*. Several examples of these boilers are shown and described, comprising amongst others, a marine boiler, the fires of which rest upon a horizontal water space, which divides the furnace from the ash-pit, the air current as in the other boilers, being admitted through the water space by means of short tubes, through which the ashes fall.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1866, January 31.—N° 312. (* *)

DUFRENÉ, Hector Auguste.—(*A communication from Justin Thevenet.*) — (*Provisional protection only.*)—" An improved hy-" draulic steam hammer."

" This machine consists of a foundation plate resting on the " ground, with which is connected the body of a press with a " double receiver of liquid. A steam piston which works in a " cylinder has a rod which acts as a pump piston direct into one " of the receivers; these receivers are in communication or not " by means of suitable valves according to the use or mode of " working the hammer. The steam piston is balanced by an " upward pressure of steam on a lift piston to which it is directly " attached. The to-and-fro movement of the working lever " acting on the slide valves for the supply of steam, whether " acting on the motive piston of the pump, on the piston, the " movement of which works the valves, or on the left piston, " communicates its different motions to the piston according to " the work to be done."

[Printed, 4*d.* No Drawings.]

A.D. 1866, February 3.—N° 336.

MOLDEN, Thomas.—This invention relates to furnaces with movable fire-bars, for steam boilers and other purposes. It is shown and described as applied to an ordinary horizontal cylindrical boiler, with internal furnace and flue. The fire-bars are transversely disposed on side bearing bars, and have a limited lateral movement combined with an up-and-down motion, given to them by means of a series of excentrics fixed upon a longitudinal shaft, which extends under the whole range of bars, and is operated by a lever handle in front beneath the furnace door. A diagonal range of grate bars is fixed in front of the bridge, leaving space between for the admission of air, and a pipe is provided for the passage of air from the ash-pit to the back of the bridge, through which pipe a jet of steam is introduced when necessary. A series of slotted openings is made in the furnace door to admit air by means of a sliding plate. The incandescent fuel accumulates against the diagonal range of grate bars in front of the bridge, through which sufficient air is admitted to consume the smoke and promote combustion.

[Printed, 10*d.* Drawing.]

A.D. 1866, February 6.—N° 359.

RASTOUIN, Vincent.—(*Provisional protection only.*)—This invention, relating to augmenting and transmitting motion, is stated to be applicable to steam engines and other apparatus. It is exhibited as applied to a vertical steam engine, the connecting rod of which gives motion to a crank shaft, whereon is a fly wheel. A second crank shaft, mounted upon the framing parallel with the first, is connected thereto by a coupling rod, the length of throw of their respective cranks corresponding. The two fly wheels and shafts are otherwise connected by a system of levers and connecting rods, the movements of which assist in the conjoint action of the two fly wheels. Motive power is given off the second crank shaft by means of a strap and pulley keyed thereon.

[Printed, 8*d.* Drawing.]

A.D. 1866, February 7.—N° 371.

ABEL, Charles Denton.—(*A communication from Charles Achille Tranchant.*)—(*Provisional protection only.*)—This invention relates to slide and expansion valves for steam engines. The engine cylinder is fitted with two valve boxes; one, the expansion valve box, being superposed upon the other, which is attached to the cylinder and contains the main slide valve. These boxes communicate by a single aperture made in the seating of the upper or expansion valve, which is hollow and provided with two apertures in the face, through which the steam intermittently passes into the main slide box, as the openings in the slide alternately coincide with the aperture through the seating. The free end of the expansion slide rod "is hinged to one end of a double-
" ended lever, the other end of which has the requisite rocking
" motion imparted to it from an excentric on the crank shaft.
" The fulcrum of this lever is capable of varying its position rela-
" tive to the points of attachment of the slide valve and excentric
" rods, *thereby also varying* the stroke of the expansion valve
" *according to the speed* of the engine, by being attached to the

" slide of a pendulum governor, or to the moving part of any " other known arrangement of governing or regulating apparatus, " and by being made to work in a slot formed in the lever, which " is prevented from rising and falling with its moveable fulcrum " by a curved loop formed on its lower extremity being made to " work on a fixed pin." In locomotive engines, the frictional action of one of the wheels may be substituted for the ordinary governor, and in marine engines, annular steel springs may be substitued for the pendulous governor balls, for effecting the necessary movements of the fulcrum of the rocking lever. No steam is admitted to the piston until it has performed one-sixth of its stroke in either direction, dependence being placed upon the fly wheel to overcome the vacuum which would form alternately behind the piston at each end of the cylinder, until suddenly relieved by the proportionately increased rush of steam. By the adoption of these arrangements, economy in the consumption of fuel is anticipated.

[Printed, 4*d.* No Drawings.]

A.D. 1866, February 7.—N° 375.

LEWIS, JOSEPH.—(*Provisional protection only.*)—This invention relates to meters for measuring and regulating the flow of liquids; it is in part applicable for regulating the flow of steam.

1st. These meters are constructed with diaphragms of india-rubber or such flexible material as will stretch when pressed against by a fluid. A curved shield in diameter nearly corresponding with the interior of the valve case, is placed on each side the diaphragm, and to these shields the usual rods are affixed.

2nd. Refers to valves for meters, which consist of a plug working in a socket; an aperture is formed at each end through the plug for the passage of the fluid, and between these apertures, a contracted diameter of the plug constitutes another fluid way. Equilibrium of pressure is established by forming the plug flat or hollow at right angles to the two apertures. This part of the invention is applicable to valves for regulating the flow of steam.

3rd. Relates to a spring and apparatus for effecting the changes of the valves of meters. When the piston rod has moved through a determined space, a lever pressed upon by the spring liberates a catch, and allows the spring to act against the lever, which shifts the valve; the same result is effected on the return motion of the rod, by means of the liberation of another catch.

4th. Relates to a diaphragm valve, and 5thly, to a method, by means of an india-rubber tube attached at the ends respectively to the piston and the casing, for obviating the necessity for the use of ordinary stuffing boxes, for the piston or valve rods of meters. The tube is caused to stretch and contract when employed with a reciprocating motion, and to operate tortionally with a rotary motion.

[Printed, 4*d*. No Drawings.]

A.D. 1866, February 8.—N° 384.

DEYMANN, HENRY.—(*Provisional protection only.*)—This invention relates to the construction of a rotary steam engine, which consists "of, firstly, a fixed circular cylinder; secondly, a piston " moving in the cylinder and attached to a wheel; thirdly, the " wheel, which consists of an ordinary three-spoked wheel, one of " which spokes serves as a pipe for the introduction of steam into " the cylinder, the axle of this wheel forms the driving shaft of " the engine; fourthly, a sliding bar, which forms the bottom of " the cylinder; fifthly, a pipe for the introduction of the steam " fixed by three arms to the cylinder; sixthly, a pipe for the " discharge of the steam placed on top of the cylinder. The " action of the machine is as follows:—The steam entering " through the tube is introduced into the cylinder through one of " the three spokes of the wheel, the steam having entered the " cylinder between the sliding bar and the piston forces the latter " to make a rotary movement, and escapes through the waste " pipe. When the greatest pressure has passed off by the escape " of a great part of the steam the piston raises the slide bar, which " falls back as soon as the piston has passed, and while the piston " and the slide bar make this movement the opening of the " supply pipe is hermetically closed by a part of the pipe attached " to the supply pipe. The rotary movement of the piston sets in " motion at once the wheel and the driving shaft."

[Printed, 4*d*. No Drawings.]

A.D. 1866, February 8.—N° 385. (* *)

ATWATER, JOHN BOWMAN.—"An improved apparatus for " raising or forcing water by the aid of steam and air for supply" ing *locomotive tenders* and for other purposes."

"I take a strong and capacious vessel and partially immerse it " in the water of the well or tank from which the water is to be " taken, and attach a pipe to be connected to a boiler to admit " steam at will through two branches near the top of the vessel. " I provide a self-acting valve opening upward through the bottom " of the vessel and a discharge pipe leading from near the bottom " of the vessel to the place where the water is to be delivered. The " vessel is divided above the middle by a horizontal diaphragm " provided with a valve opening downward. The two branches " of the steam pipe are connected to the vessel, the one at the " top and the other immediately beneath the valve partition; " both are controlled by cocks. In operating the invention the " steam is admitted suddenly through the upper branch of the " pipe, and drives the air down before it through the valved partition. The steam is then shut off from the upper chamber and " admitted into the lower, the incoming steam being directed " upward against the valve in the partition so as to insure its " prompt closing."

[Printed, 8*d*. Drawing.]

A.D. 1866, February 10.—N° 425.

FAREY, BARNARD WILLIAM.—This invention relates to steam engines, consisting of high and low pressure cylinders combined. In " constructing a horizontal combined high and low pressure steam " engine one end of the larger or low-pressure cylinder is affixed to " two brackets cast upon one end of a suitable bed plate; between " these brackets is placed the smaller or high-pressure cylinder, " the back end of which is fastened to the front end of the low-pressure cylinder. The piston rod of the larger or low-pressure " cylinder works through a stuffing box formed on the cover on " the back end of that cylinder, and the piston rod of the smaller " or high-pressure cylinder works through a stuffing box formed " on the cover at the front end of such cylinder. On the outer " end of each of these piston rods is fixed a cross head, and the " two cross heads are connected by side rods outside of the two " steam cylinders. The cross head on the piston rod of the high-pressure cylinder is supported by and slides between guides " formed on the bed plate. To the centre of this cross head one " end of the connecting rod is attached, and the other end is connected to the crank of the main or driving shaft of the combined

" engine. The air pump rod receives motion by its upper end " being pin-jointed to an enlargement of the end of the connect- " ing rod near where it is connected to the crank pin of the main " or driving shaft, and this pump rod is caused to work correctly " by means of a parallel motion; or the air pump may be worked " by side rods or otherwise. The valve boxes are by preference " formed on the upper sides of the two cylinders, and the two " valve boxes are connected by steam passages formed in the " cylindrical castings. There is an expansion valve to the valve " box of the high-pressure cylinder, which is arranged to be " adjusted at any time with facility. The valve rods and gearing " are worked by excentrics on the main or driving shaft of the " combined engine."

[Printed, 10*d*. Drawing.]

A.D. 1866, February 15.—N° 479.

ADAMS, Thomas, and PARSON, George John.—This invention relates to slide valves, pistons, and glands, and consists in constructing a slide valve, so that the effect of the steam acting on its back, shall be equal to the effect of the steam acting on its face; but should the surfaces so acted upon not be opposite each other, then their surface areas, multiplied by the distances of their centres of action from the centre of the valve, should be made equal. "The " said surfaces formed by spaces on the back and face of the valve " respectively are proportioned to each other as required by the " insertion of a ring in the back of the valve, the outer edge of " which ring determines the displacement of steam from the back " of the valve. This ring is constructed with a flange on its outer " side, the top side of the flange forming a fillet to work against " the door of the valve box or division plate, and being equal in " area to the bottom side of the flange. This ring is also con- " structed and fitted so as to admit of an equal area of steam space " above and below its inner part. The steam from the boiler " will be caused to act over equal areas on the top and bottom of " the flange of the ring, thereby balancing the pressure on the " outer part of the ring; and the recess or steam space at the top " of the inner part of the ring is equal in area to that at the " bottom of the same, and the ring is balanced by the pressure of " the exhaust steam acting equally therein."

Wedge-shaped rings are used for the metallic packing of pistons and glands, "the expansion of such rings being regulated by the " area of lateral surface exposed to the action of steam admitted " from the cylinder. By means of the adaptation of the area of " the spaces in the rings to the medium pressure of steam in the " cylinder any undue amount of friction will be avoided."

[Printed, 10*d*. Drawing.]

A.D. 1866, February 15.—N° 484.

WARD, PETER.—This invention relates to a composition for preventing and removing incrustation in steam boilers, for lubricating machinery, and scouring cloth and other substances. For these purposes, 10 cwt. of dry pulverized peat is dissolved by boiling in a solution of caustic soda or potash, say 5 cwt. of caustic soda (containing 64 per cent. of soda) in from 10 to 15 cwt. of water; to be boiled together in a cast-iron pan, and evaporation continued until the mass when cold is about the consistency of soft soap. In preparing water for feeding steam boilers, from ½ to 1½ lb. of the composition may be used to every 100 gallons of water, according as the water contains in solution more or less earthy matter. For lubricating purposes, 12 cwt. of the peat compound, mixed in a heated state with 8 cwt. of petroleum or other cheap oil or fatty matter, will impart to the compound a good lubricating quality. For scouring purposes, a compound of potash and peat is preferred, combined during preparation with hard or soft soap, in the proportion of 1½ cwt. of soap to 3 cwt. of peat compound. The compound may be used alone without the soap.

[Printed, 4*d*. No Drawings.]

A.D. 1866, February 15.—N° 486.

NEWTON, ALFRED VINCENT.—(*A communication from Ebenezer Danford.*)—This invention relates to a "mode of and apparatus " for generating superheated steam." A spherical steam generating vessel of the requisite capacity, is so disposed in a suitable furnace by suspension from the roof, that its external surface is completely exposed to the heat of the fire. A regulated quantity of water being introduced into the vessel is quickly converted into natural steam, and afterwards into superheated steam at a *determinate* temperature. A coil of pipes is employed, furnished with numerous fine orifices at one end, which enters and extends to about the centre of the generator, and by means of this coil water is injected or forced therein, care being taken to regulate the quantity of incoming water in relation to the volume of superheated steam contained in the vessel. All superabundant water is discharged through an outlet pipe. Whilst the injected water is passing through the coil of pipes within the furnace, it is heated nearly to the temperature of the superheated steam, and it becomes superheated steam the moment it is injected into the generator and mingles with the superheated steam therein; the water being converted into steam by the heat of the superheated steam contained in the generator, and not by contact with the heated metal whereof the generator is constructed. The pipe which conveys the steam to its use, opens out at the top of the generator.

[Printed, 10*d*. Drawing.]

A.D. 1866, February 15.—N° 487.

GALL, Charles.—This invention relates to "apparatus for "effecting the consumption of smoke in steam boiler and other "similar furnaces." For this purpose, an opening into the flues is made at the back of the ash-pit, under the furnace bridge, which is built upon a metal plate. A flap valve covers this opening, which valve is by means of suitable mechanism in connection with the furnace door, drawn back when the door is thrown open to feed the fire, but remains open when the door is shut, and is afterwards slowly and gradually closed by the apparatus, which then acts independent of the door, in order that when fresh fuel is thrown upon the fire, an additional quantity of air may be mingled with the products of combustion in the flues, and by thereby increasing their inflammability, cause their consumption. The apparatus consists of two water cisterns, which are mounted respectively on the ends of a horizontal tilting lever, the fulcrum of which is fixed to the front of the boiler; by means of a vertical spur piece attached to the furnace door, the lower cistern into which the water during the previous closing of the valve had gradually drained, is raised when the door is opened, which causes a reflux of the water, at the same time that the flap valve is simultaneously raised. When the furnace door is closed, the fireman, by means of a small cock, opens a communication between the lower parts of the cisterns, which, as the weight in each gradually becomes equalized, by degrees assume their normal position, at the same time, by means of the connections therewith, the flap valve is gradually closed.

[Printed, 8*d*. Drawing.]

A.D. 1866, February 16.—N° 503.

WHITEHEAD, James Heywood.—This invention relates to apparatus for heating feed water for steam boilers, and for cleaning from the surface of the heating tubes, the soot and dust which are constantly accumulating thereon. For this "purpose small pipes "are used through which the streams or jets of steam pass; these "pipes are suspended from a main pipe which is on wheels to "facilitate its movement to-and-fro. This main pipe is fed by "steam from the boiler through a pipe moving through a stuffing "box, or by other means which allow the main pipe with the "smaller pipes to traverse the whole length of the water pipes "which are liable to become covered with soot. The heating pipes "are arranged in a series of tiers or zig-zags lying in a horizontal "position, and in between these tiers or zig-zags and crossing "the heating pipes at right angles, are the small steam pipes "which are perforated, the perforations being on each side of the "steam pipes and over the centre of the heating pipes, which "they cross. In place of steam air under pressure may be "employed."

[Printed, 10*d*. Drawing.]

A.D. 1866, February 17.—N° 504.

FLETCHER, John.—This invention, relating to "valves for regulating the pressure of steam and other fluids . . . . consists "in applying to an ordinary stop valve an inverted regulating cone "plug or valve fitting within a case in which are holes or ports "for the entrance and exit of the steam or other fluid. This "regulating plug is fixed to a spindle which is weighted in any "convenient manner, and in order to dispense with a stuffing "box the spindle passes through a flexible metal diaphragm. "Above the case containing the regulating valve is screwed a "bush fitting in the case of the stop valve; this bush is secured "by a cap and gland, forming a steam-tight joint; to this bush "is screwed a flange between which and another similar flange, "the flexible diaphragm above referred to is securely held. "When this regulating plug is in operation the pressure of steam

" or other fluid causes it to rise as soon as the pressure overcomes " the weight on the spindle, thus closing the ports in the case, " but when the pressure is below the weight on the spindle the " plug drops to open the ports, and allows the steam or other " fluid to pass at the required pressure. The traverse of the " regulating plug is limited by a lock nut screwed on the " spindle."

[Printed, 10*d*. Drawings.]

A.D. 1866, February 17.—N° 513.

KIDD, Joshua.—"This invention has for its object improve" ments in vaporising apparatus, which improvements are appli" cable and intended to be used for increasing the lighting " properties of gas, for generating steam or gas, and also for " generating hydrocarbon vapours, which vapours I mix with " air or steam, either separately or combined, and use the same " as fuel for heating steam boilers, or for obtaining motive power. " One essential feature of my invention is that I apply the heat " to the top instead of to the bottom of the column of liquid as " at present adopted. By this method of heating the liquid the " surface is kept at a higher temperature than the under volume " of liquid, consequently it is not agitated by rising bubbles of " vapour. When liquid hydrocarbons are evaporated the heat " and evaporation are not checked by the deposit of tarry " matter."

Two methods of generating vapours, and the construction of the apparatus employed are described. 1st. The liquid hydrocarbons are heated and evaporated from the top of their vertica column, and there, as required, mixed with air, steam, or gas, in vessels so arranged that the heat can be applied to the centre of the apparatus, and its intensity there regulated, or the liquid is raised to the point of combustion by capillary attraction, and there mixed with gas for steam generating and lighting purposes. 2nd. The liquid, heated and evaporated from the top of its vertical column, is injected by pressure into a heated vaporizer or retort where steam or hydrocarbon vapour is generated; the steam is used as a motive power, and the hydrocarbon vapour is mixed with steam in the retort, and used as an auxiliary fuel for heating steam boilers and other purposes, the mixed vapours being ejected upon the coal or coke burning in ordinary furnaces.

[Printed, 1s. Drawing.]

A.D. 1866, February 20.—N° 523.

WILLIAMSON, THOMAS, and MARREN, EDWIN PATRICK.—(*Provisional protection only.*)—This invention, relating to "im-
" provements in valves . . . . consists in adding in any
" convenient position a circular spring, either corrugated or plain,
" to an ordinary equilibrium valve; the spring being an adjunct
" to the equilibrium valve enables the valve to be sensitive to the
" least amount of pressure by steam or water admitted into the
" valve box. The said spring is acted upon by a lever and weight
" which presses upon a spindle, and thus regulates the pressure
" to the greatest nicety. We protect the aforesaid spring from
" corrosion by plating it with an ante-corrosive metal or
" material."

[Printed, 4*d*. No Drawings.]

A.D. 1866, February 21.—N° 532.

BONNEVILLE, HENRI ADRIEN.—(*A communication from Eugène Petry Chaudoir.*) — (*Provisional protection only.*) — "This
" invention relates to an improved arrangement of tubular boilers
" allowing of more easily withdrawing the tubes for cleaning. It
" consists in making these tubes moveable by means of one or
" more suitable nuts placed at one or both ends, which, while
" holding the ends of the tubes against the boiler end plates, may
" easily be unscrewed to allow of their removal."

[Printed, 4*d*. No Drawings.]

A.D. 1866, February 21.—N° 533.

GEDGE, WILLIAM EDWARD.—(*A communication from Thomas Mondini.*)—This invention relates to the arrangement and construction of steam boilers. As shown by the drawing, a horizontal cylindrical boiler shell containing four large flué tubes which extend to and open at each end, is mounted on a rectangular metal casing containing the furnace and fire-grating, which is furnished with hollow fire-bars. The flaming products of combustion and hot draughts, rise from the furnace against the bottom of the boiler, and coursing backward to the end, there rise and enter one of the lower internal flues, returning from the front of the boiler by the other, then taking the two upper flues in succession in the same manner. The front ends of the flues are closed in by a metal plate, which is fitted with the furnace door, and with openings which when uncovered are for the purpose of cleaning the flues; the back is closed in by a plate of a similar form, and other plates are arranged at right angles therewith to direct the hot draught in succession through the flues. The boiler is supported by short tubes, which form water communications with a cistern underneath.

[Printed, 8*d*. Drawing.]

A.D. 1866, February 21.—Nº 537.

BAYLISS, Henry.—(*Provisional protection only.*)—This invention relates to the construction of wire brushes, suitable for cleaning gun barrels, the tubes of steam boilers, and other tubular articles. It is described as follows :—" I take a flat ring of brass " or other metal of about one-half the diameter externally which " the finished cleaner is intended to have. I take a series of " short lengths of fine wire (the wires being somewhat longer " than the diameter of the finished cleaner) and arrange them " in the ring in a tubular form. I bend the wires outwards on " both sides of the ring, thus making one-half of each wire lie " against one of the flat sides of the ring, and the other half of " the wire against the other flat side of the ring. The doubled " wires are thus made to lie radially on either side of the ring in " the position of the bristles of a rotary brush. The ring of wires " may be fixed to a cylindrical holder by a screw passed through " the ring and taking into the end of the holder, the ring being " held between the head of the screw and the end of the holder. " Any required number of the rings of wire may be strung upon " a screw of sufficient length, and bound together by the screw " taking into the holder. I prefer to put metal washers between " the different rings of wire in order to keep them a short " distance apart. By combining together a series of the rings of " wire a cylindrical cleaner of any desired length may be made. " I employ either steel, iron, brass, or German silver, or other " wire."

[Printed, 4*d*. No Drawings.]

A.D. 1866, February 23.—Nº 557.

PARKER, James.—(*Provisional protection only.*)—This invention relates to motive-power engines, and to using the foul air from mines as *fuel*. It is supplemental to a prior invention relating to the combination and use of air and steam in a non-condensing engine as a motive power, for which Letters Patent were granted to this inventor bearing date October 23rd, 1863, No. 2,620. According to the present invention, any ordinary low-pressure condensing engine may be employed in the same manner without any increase in the size of the cylinder. A condenser having a partial vacuum is now used, "into which is discharged "the exhaust steam and air, or moist air from the cylinder, by "which means the steam or moisture in the air or a large part of "it condenses, and the air previously in combination with the "steam cools and contracts considerably, and it is then drawn off "from the condenser by steam jets and nozzles similar to those "used to drive in the atmospheric air." It is proposed, amongst other things, to apply the vacuum pressure "as a means of "giving motive power to engines where the pressure of steam, "hot or compressed air, or gas, may be objectionable by reason "of danger from explosion or otherwise, or where it may be "desirable to use a cold motive power or a motive power not "liable to loss by condensation. The boiler and jets and nozzles "may be placed at a distance of even several miles from the "vacuum engine with but very little loss of power, and therefore "will be of great service for mining purposes, and also because "the foul air or gas in the mine will thereby be drawn from the "mine and be replaced by a constant stream of fresh atmospheric "air flowing into the mine to restore the equilibrium of pressure. "The foul air or gas drawn from the mine if inflamable "will be discharged into the fire of the boiler outside the mine, "where it will be used as fuel to generate steam. In some cases "I think the discharged inflamable gas will probably supply "the greater part of the heat necessary for working all the "engines of the mine, both inside and outside the mine."

[Printed, 4*d*. No Drawings.]

A.D. 1866, February 23.—N° 563.

SMITH, THOMAS JONES.—(*Provisional protection only.*)—This invention relates to working the steam in steam engines expansively, combined with a variable cut-off. Instead of an ordinary excentric, a cam, which works between two rollers, is employed to give uniform motion to the slide valve. The cam is fitted on the main shaft, and the rollers on studs fixed in the rod which operates the valve. This rod is divided into two or more lengths, and one or more oscillating levers with adjustable joints are interposed, whereby the length of the leverage of the rod may be self-regulated, and the stroke of the valve increased or diminished The peculiar shape of the cam causes a temporary stop in the motion of the valve, which allows the steam to expand, and favours the exhaust. When this action of the cam is combined with the action of the levers, "a complete command is given over "the opening of the ports."

[Printed, 4d. No Drawings.]

A.D. 1866, February 23.—N° 566.

KERR, Peter.—(*A communication from Messrs. Hughes and Phillips.*)—(*Provisional protection not allowed.*)—This invention relates to "arranging and working steam engines valves." The 1st part consists in operating the valves by means of a revolving crank, the pin whereof works in a block, which slides laterally to and fro in a recess formed in a slide, and gives vertical motion thereto. A curved projecting piece, or "cut-off toe" is attached to the block, and moves laterally therewith. The steam valve spindle rests upon, and is lifted, and the valve thereby moved in one direction by a regulating rod, the longitudinal motions of which are caused by the variations of the governor, to which it is connected. The free end of the regulating rod, whereon the valve spindle rests, bears upon the "cut-off toe," and more or less operates the valve as the point of contact of the rod upon the curved surface of the "cut-off toe" is changed by the action of the governor. The valve is returned by a spring, the movement being retarded and regulated by the "cut-off toe" in conjunction with the position of the regulating rod. The 2nd part consists in placing a collar in the valve chamber, for the purpose of occupying the space in the steam passage between the upper and lower steam valves. This collar is held in position by a screw, and has a hole through it to admit of the free working of the valve spindle.

[Printed, 10d. Drawing.]

A.D. 1866, February 24.—N° 579.

WINBY, Frederick Charles, and WINBY, Clifford Etches.—This invention relates to the application of power to machines for *rolling metals*. This is effected by means of a movable toothed rack, which rests horizontally on rollers, and is made to impart reciprocating motion longitudinally, by the motions of the piston rod of a steam engine, or by an hydraulic ram, to the end of either of which, according to the description of power employed, it is attached. The rolling machine is placed at right angles to the line of the rack and piston rod, and on the axis of the bottom roller of the machine there is fixed a tooth wheel, which by engaging with the teeth of the rack, causes the roller to revolve. On the other end of the axis of this roller is a tooth wheel, which gears into a corresponding toothed wheel fixed on the axis of the top roller, to which it thereby imparts simultaneous motion, the diameters to the pitch lines of the two wheels corresponding with the diameters of their respective rollers. The motion of the rollers in relation to the speed of the rack may be increased or diminished when necessary by the use of additional toothed gearing on a counter shaft. Instead of transmitting the power of the piston to the rolling machine by means of the rack, a chain wound on a drum fixed on the roller axis, may be employed for the purpose.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, February 27.—N° 607.

TRENT, Joseph.—(*Provisional protection only.*)—This invention relates to "an even balanced tubular slide valve for steam "or other engines." The valve is made to fit and slide freely within a cylindrical case, which may be either cast with the engine cylinder or secured thereto by bolts or screws. Each end of the case is closed by a suitable cover, through which at one end the steam enters, and at the other end through a stuffing box, the valve rod, which is actuated by an excentric in the usual way. The steam induction ports open from the cylinder to the interior of the casing, and corresponding apertures in the valve, as it slides to and fro, are brought coincident therewith. The exhaust steam passes outside the valve in a suitable recess sunk in its exterior, which forms a passage between it and the interior of the case, communicating with the exhaust pipe. Metallic packing rings are employed to keep the valve steam tight. The steam pressure being nearly equalized in all directions upon the valve, it works with very little friction, and consequently requires but little power to move it.

[Printed, 4*d.* No Drawings.]

A.D. 1866, March 1.—N° 621.

DOW, JAMES DALY.—This invention relates to steam boiler furnaces, which are constructed to operate on a principle adverse to ordinary boiler furnaces. The fire-bars are tubular and transversely disposed, so as to communicate with the water spaces forming the sides of the furnace, which is merely an open chamber without a fire-door, and does not communicate with the flues. The plane of the fire-bar surface inclines forward, and sometimes is protected by a range of solid bars, placed respectively above the tubes: in other furnaces, two sets of tubes are introduced, one set directly over the other. The ash-pit is closed by a door in front, but is open at the rear to the boiler flues. The air necessary to support combustion enters at the open mouth of the furnace, and passes down through the burning fuel, carrying in its downward draught the flaming gaseous and other products of combustion between the fire-bars into the ash-pit beneath, passing thence through the open passage in the rear upwards behind the furnace into the flues or tubes of the boiler, or otherwise into segmental flues formed to rise on each side of the furnace. When the boiler is in operation, the furnace is always open, and the ash-pit closed, but if at any time it becomes necessary to moderate the heat, it is immediately effected by partially closing the furnace mouth, and admitting a limited quantity of air to the ash-pit.

[Printed, 8*d*. Drawing.]

A.D. 1866, March 3.—N° 643.

WALKER, ROBERT.—This invention relates to a calendering, mangling, and finishing apparatus, which is directly combined with steam power. The machinery consists of strong metal side frames or housings, which are bolted upon a base plate and contain the spindle bearings for three horizontal rollers, the axes of which are disposed above each other in a vertical line. The spindles of the rollers project beyond their bearings on one side of the machine, and carry worm wheels. The wheels upon the top and bottom rollers are firmly fixed on the spindle ends, but the wheel on the central roller is fitted either to revolve thereon, or to be made to revolve with the other worm wheels, by means of a vertical screw, which at the different heights of the horizontal planes of the axes of the rollers, engages with the teeth of the wheels. The lower end of the screw is directly acted upon by the piston of a steam cylinder, which is fixed in a suitable place made in the base of one of the side frames. The bearings of the top roller are stationary, the necessary pressure by means of levers, hydraulic rams or pistons, being applied beneath the bearings of the lower rollers, which move between vertical facings in the side frames. The fabric to be operated upon is wound on the central roller, during which operation the roller is thrown out of gear with the screw and turned by independent means.

" In other modifications the worm wheel on the middle roller " may be dispensed with, in which case that roller, when not in " contact with the upper roller, may be driven by contact with " the bottom roller for putting the goods on or off. Or instead " of three worm wheels there may be a single one fixed on the " spindle of the middle roller, the top and bottom rollers in " that case receiving their motion by contact with the middle " roller."

[Printed, 10*d*. Drawing.]

A.D. 1866, March 3.—N° 650.

POLLIT, JOSEPH, and **WIGZELL**, EUSTACE.—(*Provisional protection only.*)—This invention relates to apparatus for drying steam, and heating the feed water for stationary steam boilers. It " consists of a double box or an enclosed vessel divided by a " partition into two compartments, each being provided with a " branch pipe, the one for inlet and the other for outlet of steam " or water. One of these boxes or compartments has an opening " in the side opposite to or parallel with the partition, and a " pipe or tube having one end closed and the other open is fixed " in or to the said opening with its closed end projecting outward. " The partition has also an opening of smaller dimensions, " in which another tube or pipe open at both ends is fixed, projecting " through the aforesaid compartment and concentrically " into or within the first-named tube, nearly to or within a short " distance of its closed end, leaving a passage from one tube to " the other. One or a series of such vessels is or are placed in " the flue or flues of a boiler or steam generator, the inlet branch " or branches connecting by a pipe or pipes with the steam " chamber of the boiler, so that steam may pass therefrom into

" this vessel or vessels and through the inner tube or tubes into
" and through the annular space or spaces formed betwixt the
" inner and outer tubes and into the other compartment, thence
" passing through the outlet pipes it may be conducted by other
" pipes or pipe to the place where it is required to be used. The
" flame or heat passing from the furnace of the boiler circulating
" about these vessels and the tubes thereof dries the steam as it
" passes through them. . . . . . . When this apparatus is
" used for heating the feed water the inlet branches or branch
" are or is connected to the supply, and the outlet branches or
" branch to the boiler or steam generator, whereby the said feed
" water is heated during its passage."

[Printed, *4d*. No Drawings.]

A.D. 1866, March 3.—N° 657.

BISCHOFF, JOHN.—(*A communication from Robert Creuzbaur.*) —This invention relates to steam cultivators, and to traction and portable steam engines, and consists :—

1st. In the application to a steam traction engine, travelling on two driving, and one steering wheel in front, of one or more horizontal circular frames, which rotate on vertical axes carried by a transverse beam at the after end of the engine. The circular frames carry the ploughs, coulters, scarifying blades or necessary implements for performing different kinds of work, and are actuated by chains and chain wheels, set in motion by bevel gearing driven by a pinion on the engine crank shaft, which actuates the two driving wheels at the required speed by means of two sets of differential gearing. Provision is made for raising and lowering the scarifying frames, and for setting the blades to work into the soil at the required depth, also for guiding, stopping, starting, and reversing motion.

2nd. Relates to apparatus attached to an agricultural steam carriage for digging trenches or ditches.

3rd. Consists in overcoming the dead points of the crank shaft of an agricultural engine, actuated by the piston rod of a single steam cylinder. This is effected by attaching a small cylinder to the main cylinder, and by means of the small piston rod so act at the proper time upon a set of levers, that the main crank is thereby pushed over the dead points.

4th. Relates to the construction of the boiler, which is cylindrical and vertically disposed upon the carriage frame. The steam cylinder is inverted and attached to the boiler, which contains a number of pendent water tubes; these tubes are attached to the top of the fire-box and reach down to the fire-bed. Concentrically placed within each tube there is a smaller tube for causing a downward and upward flow of the water. From the top of the fire-box, a circumposed series of vertical tubes convey the products of combustion through the upper water and steam spaces to a hemispherical chamber, formed over the crown of the boiler and communicating with the chimney. The hemispherical chamber "is surrounded and covered by a double jacket or casing " forming an inner and an outer air space . . . . on the top of the " boiler; these two casings form an inner and an outer cylindrical " box in which is placed on a vertical spindle a fan with obliquely " set blades. The escape steam from the cylinders passes into a " large circular tube placed horizontally round the top of the " boiler between the inner and outer jacket, and a number of " smaller tubes fixed into this tube reach down between the inner " and outer jacket, and dip with their open ends into the feed " water which encircles the lower part of the boiler. When the " fan driven from the crank shaft is in motion cold air is drawn " in at the lower end of the outer casing, and this cold air passing all round the small vertical tubes will become partially " heated and at the same time cause a portion of the steam in the " said tubes to condense and run into the feed water. The air is " drawn over the edge of the inner casing into the cylindrical " fan box, and by the fan it is forced down between the inner " casing and the boiler and into the furnace above and below the " grate bars. The fan is loose on its spindle, and when the speed " of the engine is increasing the fan rises, and by so doing raises " the shorter arms of two levers, one of which is connected with " the throttle valve of the steam pipe and the other with a " damper in the funnel. The fan therefore serves the triple purpose of condensing the escape steam and converting it into " feed water, of supplying hot blast to the furnace, and, finally, " of regulating the speed of the engine."

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1866, March 5.—N° 661.

S, James.—(*Provisional protection only.*)—This invention o an improved superheater for a certain class of steam

boilers known as "Flash Firers," the object being to utilize the gases generated within the flues of such boilers, which gases are more or less wasted. The inventor says, "I effect this by extend-
" ing or continuing the side flue (which is usually carried up to
" the water line) over the upper surface of the boiler. Along the
" centre of the boiler at the top I place a line of brickwork to
" separate the side flues, and at either end of this superheater or
" hot-air chamber I place a course of brickwork, so that there
" shall be no through draft, but the flames confined to their usual
" channels. . . . . The upper parts of the flues therefore by
" this arrangement are chambers filled with hot air, which acts
" upon the plates constituting the steam chamber of the boiler."

[Printed, 4*d.* No Drawings.]

A.D. 1866, March 5.—N° 665.

HACKETT, Henry.—This invention relates to a safety valve or apparatus for steam boilers; it is designed to prevent explosions from over pressure, and check any increase in pressure when there is any deficiency of water in the boiler. The apparatus consists of an internal cylinder surrounded by an outer cylinder, the two being divided by an annular space, and cast together upon a bottom flange, which is secured to the top of the boiler. A valve closes upon the top of the inner cylinder and the annular space, fitting inside the outer cylinder, which is closed by a top cover, allowing space for the valve, which is weighted internally, to rise. The bottom of the inner cylinder is open to the boiler, so that steam has access to the valve, and by means of tubes which descend into the water space, the water is by the steam pressure in the boiler forced upwards into the annular space, from which an outlet tube above the level of the valve seating, forms a communication with the furnace. The arrangements for weighting the valve within the boiler are so managed, that the valve will be lifted either by excess of steam pressure or when the water in the boiler is below the safety level; and when either condition occurs, and the opening to the outlet tube is uncovered by the lifting of the valve, a rush of steam and water takes place down the tube, which being turned up at the lower end, the escape is directed against the roof of the furnace, whence it falls in a shower upon the fire, which is either damped or extinguished thereby.

[Printed, 8*d.* *Drawing.*]

A.D. 1866, March 5.—N° 666.

DAVIES, George. — (*A communication from Isidore Nillus, the younger.*)—This invention relates to portable steam engines. The boiler is composed af a horizontal cylindrical body, which contains a main flue, and a group of return tubes; it is united to a vertical body, which contains a low furnace, and a lofty steam chest covered in by an arched top, whereon, centrally disposed, is the chimney. The flaming products of combustion course from the furnace along the main horizontal flue into a chamber at the back of the boiler, where they rise and enter the return tubes, and are discharged into a smoke box above the furnace in front, whence they rise through a flue which curves upward in the steam chest and unites with the chimney. The engine cylinder and working parts are disposed upon a foundation frame, which is mounted upon the horizontal section of the boiler, and so fixed there by brackets as to be above the injurious influence of the radiating heat. The cylinder acting longitudinally, is centrally fixed in the usual manner upon the end of the frame near to the steam chest, with the valve chest on one side, and the feed pump, which is incliningly placed, on the other. The pump is actuated by an excentric on the crank shaft, which is transversely disposed in suitably coupled bearings across the back end of the frame. Motion is given off by means of two strap pulleys, mounted respectively at each end of the crank shaft, whereon also are fixed two fly wheels. The cross head slides and guides, and connecting rod, are conveniently disposed and work upon the frame in the ordinary manner, and the mode of distributing the steam in the steam cylinder, comprises all the details necessary to produce a variable expansion at will. The exhaust steam first heats the feed water and then forms a blast in the chimney, and the movements of the throttle valve are regulated by a governor.

[Printed, 8*d*. Drawing.]

A.D. 1866, March 5.—N° 667.

GRAY, James.—This invention relates to the preparation of chemical fluids for rendering sea water, and hard or otherwise impure water, more suitable for use in steam boilers, and for other purposes. These fluids are generally prepared in the following manner, although the chemical component proportions are subject to variation according to circumstances. To 100 gallons of water is added 3 cwt. of soda ash, and 3 cwt. of fresh burned lime; after being boiled together for one or two hours the clear liquor is drawn off and constitutes fluid No. 1. Fluids Nos. 2, 3, and 4, are made respectively in the same manner, with common soda, potash, or blackash, and pearlash instead of soda ash; and in fluid No. 5, kelp from sea wrack is substituted for the soda ash. The residuum of precipitated matter may either be subjected to a second boiling, or utilized for various useful or sanitary purposes. To one hundred horses nominal boiler power, 30 galls. of either of the fluids may be added to sea water in the boiler or in a separate vessel, which quantity, it is stated, will suffice to prevent incrustation and corrosion for one month, and one half the quantity per month will be sufficient for boilers fed with hard or impure water.

[Printed, 4*d*. No Drawings.]

A.D. 1866, March 5.—N° 668.

BERRY, William Henry.—The object of this invention is to simplify the working gear of double-action steam hammers, so as to render them capable of being used as self-acting steam hammers or hand-worked hammers. Attached to the hammer head is a rod which slides through a guide on the cylinder and terminates at top in an eye, wherein, made to work easily, is a circular block, through which there is a hole to receive a sliding bar or lever, firmly keyed on a short shaft, whereon, at the other end, there is fixed nearly at right angles to the first, another lever, which engages another circular block, working in an eye formed in the spindle of the valve for regulating the admission and emission of the steam. The short shaft is carried in an eccentric bush, which fits loosely in a bearing on the cylinder cover, and carries a lever at one end, which, by means of a connecting rod, receives motion from a hand lever, whereby the position of the axis of the shaft is changed when the eccentric bush is turned in its bearing. Two handles are provided, one for changing the position of the shaft, which effects the necessary alteration in the traverse and lead of the valve, and consequently the length of the stroke or fall of the hammer, and the other for regulating the admission of steam. The valve gear of the hammer will self-act, or, if required, can be worked by hand.

[Printed, 10*d*. Drawing.]

A.D. 1866, March 6.—N° 681.

SOUTAR, Samuel.—(*A communication from Daniel McDowell.*) —(*Provisional protection only.*)—This invention relates to a method and apparatus for cleaning the tubes of steam boilers, which is effected by the introduction into the end of each tube of a sudden issue of steam. The "apparatus consists of a jet pipe about three " feet in length, similar to that used for fire engines, with a steam " cock at the end next the handle; it is connected to the boiler " at any convenient spot by a few feet of gas piping, with two or " three bends to serve as union joints to allow the jet to be turned " in any direction. A second steam cock is placed close to the " boiler to shut the steam off from the pipe when not in use. " When the apparatus is going to be used the jet will be screwed " on and the jet cock closed; the steam cock next the boiler will " then be opened, and the pipe will be filled with steam down to " the jet cock; the end of the jet will then be introduced into the " tube, and by a sharp turn of the cock a blast of steam passes " through the tube, and every particle of dirt and crust is driven " out; the jet is then placed in another tube, and so on, until all " are properly cleaned out."

[Printed, 4*d*. No Drawings.]

A.D. 1866, March 6.—N° 682.

CAMPBELL, Archibald Campbell.—(*Provisional protection only.*)—This invention relates to a mode and apparatus for superheating steam. One or more superheating vessels or receivers are employed, and either heated by the boiler fires or by an independent furnace. These vessels are not in open communication with the boiler. When the discharge of superheated steam takes place into the engine cylinder, and the pressure in the superheaters is reduced to the pressure in the boiler, a valve opens the communication with the boiler, and the vessels are refilled with steam. The superheating action and consequent increasing pressure in the superheating vessels then closes the valve pending the next discharge to the engine. According to other arrangements the steam is passed from the boiler to the superheating vessels by means of a force pump, so that the maximum pressure is always confined to the superheaters.

[*Printed*, 4*d*. No Drawings.]

A.D. 1866, March 6.—N° 684.

NEWTON, Alfred Vincent.—(*A communication from John Bowman Atwater.*)—This invention relates to—

1st. "Working engines by the combined action of steam and "air."

2nd. "The employment of steam acting directly upon atmo-"spheric air for the purpose of compressing the air into a rarefy-"ing chamber which communicates with the valve chest of an "engine."

3rd. "Heating and expanding air and communicating to it "certain quantities of moisture by means of steam . . . . . and "then further rarefying the air thus treated for the purpose of "employing it as a motive agent." The invention, it is stated, is applicable to almost all steam engines. A steam boiler in the form of a frustum with a central furnace and vertical flue is employed. The products of combustion impinge upon and heat the air contained in a hemispherical rarefying chamber which is superposed above the boiler. The cells in a cylinder, which revolves between two fixed discs are, at a certain part of its revolution, open through one disc to communicate with and receive steam from the boiler at a very low pressure, and at another part of the revolution of the cylinder, the steam in the cells is discharged into the rarefying chamber through an opening in the other disc. These openings in the discs are, by turns, as the cylinder revolves, brought into coincidence with the cells, which also at one part of the revolution are open to the atmosphere through a separate opening in the disc which admits the steam. The rarefying chamber by means of a pipe communicates with the slide valve chest of the engine.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1866, March 7.—N° 696.

BALDWIN, Aaron Charles.—This invention relates to the construction of a rotary steam engine, the parts of which are so arranged as to be easily accessible for adjustment, oiling, and repairs. The first part relates to the arrangement, on the main shaft, of a central disc or wheel, which diminishes in thickness towards the periphery and carries two pistons, one on each side or face. These pistons work in annular grooves circumferentially formed within a fixed cylinder, which, in relation to the shaft, is concentrically disposed and rests upon a suitable foundation. At certain points in the revolution of the disc, the annular spaces are closed by resistant plates, which are projected radially in succession across the annular space, while the pistons are passing their respective induction ports, and so form fixed abutments to resist the steam in one direction, which, by pressing against the pistons in the other direction, causes the disc and shaft to rotate. These slides, which are disposed between the induction and exhaust ports, as the pistons come round, are, by the action of the mechanism, temporarily withdrawn to allow the pistons to pass, and are returned in time to resist the pressure of the incoming steam. The 2nd part relates to the manner in which the resistant slides are fitted and supported. 3rd, relates to the reducing useless steam space by a peculiar form of the pistons. 4th, relates to the fitting and working of the slide valves and to the mode of reversing motion. 5th, to a system of packing for the prevention of inward leakage. 6th, to adjusting the packing; and 7th, to relieving the pistons from friction during the passing through that part of their revolution in which they exert no power.

[Printed, 10*d*. Drawing.]

A.D. 1866, March 7.—N° 699.

BOUSFIELD, George Tomlinson.—(*A communication from Richard Dudgeon.*)—This invention relates to apparatus for expanding tubes, and thus causing the ends of boiler tubes to fit the tube sheets. This is effected by the divergent pressure of a roller applied inside the tube end. The roller is fitted into a metal stock, which slides in a longitudinal groove formed in one side of a tapering plug, which plug with the roller is inserted and forced into the end of the tube, at the same time that the plug is turned round by means of a wrench or spanner. During the operation the plug bears against one side of the tube, and the roller against the opposite side, whereby the metal of the tube is gradually distended and the tube end enlarged. A cutting instrument is attached to the stock for the purpose of trimming and finishing the end of the tube before the plug is withdrawn. Amongst the modifications there is a stock described, into which is fitted three rollers, which rollers are made to press divergently against the interior of the tube by means of a plain central plug advanced into the tube end by means of a screw, and turned by the aid of a wrench.

[*Printed, 1s. Drawings.*]

A.D. 1866, March 8.—N° 708.

MUSCHAMP, JOHN BELL and CARD, JOSEPH WILLIAM.—(*Provisional protection only.*)—This invention relates to steam engines, to which steam is supplied without the assistance or use of an ordinary boiler. The engine cylinder is (by preference) disposed near the tube plate of a fire-box of ordinary construction, and is partly surrounded by fire tubes, cast thereon, or attached in any convenient manner thereto. By means of these tubes the requisite heat is imparted to the cylinder for instanteously converting into steam a limited quantity of heated water, which, at the end of each stroke of the piston is, by means of a double-action pump, alternately injected into the ends of the cylinder, and there converted into steam in time to produce the following stroke, the quantity of water being regulated by a throttle valve operated by the governor. An ordinary slide valve is not required, a plain sliding plate being sufficient to govern the exhaust port. Instead of generating the steam direct in the cylinder, the latter may be placed contiguous to and in communication with a generating vessel, wherein the requisite amount of water, to produce steam respectively for the succeeding strokes of the piston, is, previous to each stroke intermittently injected. The water previous to use is heated by the exhaust steam or otherwise.

[Printed, 4d. No Drawings.]

A.D. 1866, March 9.—N° 716.

PATTISON, THOMAS and BOOTH, JOHN.—(*Provisional protection only.*)—This invention, relating to metallic packings for pistons, consists in the use of a double ring, which is first made a trifle larger in diameter than the cylinder in which it is intended to work, and as wide as two piston rings, and then, excepting a very small portion about one-half its width, it is divided round its circumference by a radial cut. From the ends respectively of the part which remains uncut, and by which only the two parts remain united, each half or ring is obliquely cross cut through, which leaves one end of each ring free, and from these ends sufficient metal is taken off to allow of the compression of the rings to the necessary size for fitting the interior of the cylinder wherein they are intended to work. One or more of these duplex rings may be used for the packing of a piston.

[Printed, 4*d*. No Drawings.]

A.D. 1866, March 10.—N° 731.

RICHARDSON, Charles James.—This invention relates to "arranging steam boiler and other furnaces, in order to "render them more suitable for burning petroleum and like "oils." The lower part of the furnace is shaped to the form of a trough, wherein the petroleum or other inflammable oil is supplied in sufficient quantity by means of a pipe. Blocks of porous material, about four inches thick, are arranged to fill the bottom of the trough, and these blocks have channels underneath to admit of the fluxion of the oil, which percolates upwards through the pores of the material, and burns upon its upper surface. Those oils which require to be heated before they will flow through a pipe, are placed in a vessel disposed in the front part of the trough. Steam under pressure, (or by preference superheated waste steam,) is injected through three or more jet pipes into the channels under the blocks of porous material, through which it rises, is decomposed into its constituent gases (oxygen and hydrogen), mixes with the vapour of the oil, and produces a smokeless fire. Suitable stop cocks are provided to regulate the inflow of the oil and the steam, the proper quantities being indicated by the chimney ceasing to emit smoke. Warmed air is supplied at the back of the furnace, and a pipe is provided for the escape of an excessive supply of steam.

[Printed, 4*d*. No Drawings.]

A.D. 1866, March 10.—N° 738.

BOULTON, Matthew Piers Watt.—This invention relates to generating and applying heat. It is stated that "In the "working of ordinary steam engines the expansion of the air and "gases in the furnaces affords a source of mechanical power "which is not used. With a view to obtaining the maximum "effect from the heat it is desirable that the expansive force "produced by the combustion of the fuel should be used to "produce mechanical effect, and that the heat remaining in the "products of combustion after they have performed work should *be further* utilized as a source of motive power. For this

" purpose it may be employed to generate steam in a boiler or " vessel, the steam so generated being used to perform work in " an engine." The invention consists 1st. in various modes " of constructing engines in which a mixture of gas and air or " or other inflammable matter is ignited, aud the products of " combustion are caused to pass into the interior of a boiler or " evaporating chamber and act along with the steam to produce " motive power." 2nd. Employing one or more jets or blasts of steam at high pressure, to induct or force the exhaust steam from an engine into a vessel containing low-pressure steam, which is employed to produce motive power. 3rd. Applying and fitting partitions or diaphragms in boilers to promote the circulation of the water. 4th. Causing a forced circulation of the water in steam boilers by means of a pump or propelling apparatus. 5th. Employing "the propulsive force of an ignited inflammable " mixture to drive air into a vessel in which it is contained under " pressure, and whence it is taken to act on a piston or otherwise " to produce motive power." 6th. Relates to combining with the last arrangement, a boiler in which steam is generated by the discharged products of combustion, and used for the production of motive power. And 7th "the combination of a vacuum engine " in which a partial vacuum is produced by the propulsive force of " an ignited inflammable mixture with a boiler in which steam " is generated by the products of combustion, and the mode " described of utilizing the contraction of volume which those " products undergo in generating steam as a source of motive " power."

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1866, March 13.—N° 757.

VULDY, Jean Baptisti.—(*Provisional protection only.*)—This invention relates to steam boilers, the object being to obtain perfect combustion of the fuel, and the prevention of smoke. It is proposed to transversely divide the furnace above the fire, by depressing the roof or by a "hanging bridge," which may be of solid material, or it may contain water space in communication with the water in the water spaces of the boiler, and in circulation therewith; the latter construction applied to a steam boiler is preferred, as the area of the heating surface is increased, and the *burning of the bridge* prevented. The plane of the fire-bar surface in both compartments is on the same level; the bars in the back compartment being set closer together, or in lieu of bars a perforated plate may be substituted, whence suitable arrangements are made for discharging the refuse into the ash-pit below. All the fresh fuel is fed into the front compartment of the furnace, and when thoroughly coked, it is thrust, by the aid of a rake or other instrument, under the bridge into the back compartment, and the front fire is again refreshed with fuel, the smoke from which, by means of the hanging bridge, is brought into close contact with the incandescent surface of the fire in the back compartment and consumed.

[Printed, 4*d*. No Drawings.]

A.D. 1866, March 14.—N° 759.

ELDER, John.—The object of this invention is to render the boilers and engines of steam ships, and particularly of vessels of war, capable of being worked with great economy under ordinary circumstances, and yet be able when required, to develope considerable increase of power and speed, for the special purpose, amongst others, of chasing or ramming an enemy, or in the case of a merchant steamer, of escaping from an armed foe. The engines are to be constructed for working expansively, such as those by "Randolf and Elder," termed double cylinder engines, which work, under various modifications, with high and low-pressure steam. The engines of the class described, are fitted with two pairs of cylinders, each pair consisting of a small high-pressure, and a large low-pressure cylinder, the steam at high pressure being worked in the high-pressure cylinder, and thence exhausted and worked expansively in the low-pressure cylinder. In order to meet the requirements of an increased power, the working and other parts of the engines are proportionately strengthened, and the valves between the cylinders of each pair are so arranged, that it is not necessary to interfere in the least with the ordinary valve gear when requiring to work the large cylinders with full pressure, but simply to admit the steam at all times to both ends of the small cylinder, whence it will pass with undiminished pressure through the intermediate valves and passages into the large cylinder, the small cylinder at such times *doing no work*. The boilers being arranged for producing *high-pressure steam* do not require additional strength, but are fitted with artificial means for hastening their consumption of fuel, and as a consequence, the more rapid production of high-pressure steam. To this end, between the main engines and boilers, are fitted two large blowing fans, and a small pair of engines for working them. The furnaces and ash-pits are closed, and the air is forced into the latter through a system of ducts, whereby the heat of the fires is so greatly intensified, as to raise the increased quantity of steam required to work the large cylinders with full pressure. The fans may be used for driving fresh air into gun turrets, and between decks, and when in action, for drawing off the smoke.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, March 15.—N° 778.

GOODWIN, William.—(*Provisional protection only.*)—This invention relates to a rotary steam engine. The outer case, which is fixed, contains an annular groove or chamber, wherein gyrates a piston, which is attached to and projects from the periphery of a disc or wheel, which is fixed upon a shaft supported in bearings concentric with the annular chamber. Extending radially from the annular chamber, a deep recess is formed to receive a steam resistant slide, which by suitable means is projected across the annular chamber, so as to form a steam-tight abutment each revolution of the piston, the moment the latter has passed the recess, and is suddenly withdrawn, as the piston in its succeeding revolution approaches it. There are two steam ports which open into the annular chamber, one on each side of the recess, and, according to the required direction of motion, which is regulated by the set position of a slide valve, either of the ports may be made to admit the steam and the other emit the exhaust.

[Printed, 8*d*. Drawing.]

A.D. 1866, March 17.—N° 794.

SHANKS, John.—(*Provisional protection only.*)—This invention relates to the construction of steam boilers, and to apparatus for heating feed water. According to one modification described " the boiler is made in the form of a cylinder with rounded ends, " and is set vertically in a kind of cupola formed of a cylinder " of iron lined with fire-brick; this cupola forms the furnace, the " *fire-bars being near* the bottom of it, and the boiler projects

" down to within a short distance of the bars, whilst at the upper " part there is an annular space between it and the sides of the " cupola. The fire gases pass away to the chimney from the " top of this annular space by a single opening at one side if the " boiler is small, but by a number of openings leading into an " annular flue if the boiler is large." The feed water heating apparatus, as applied to a high-pressure steam engine, consists of a chamber fitted with perforated horizontal partitions. The water is admitted into the upper part of the chamber, and falls in showers through the perforated plates, meeting as it falls the exhaust steam from the engine, which is admitted near the bottom of the chamber and passes upwards amongst the falling water. That portion of steam which avoids condensation escapes to the atmosphere through an aperture at the top. The feed pump draws the water from the bottom of the chamber, and forces it into the boiler through a pipe which passes through the furnace.

[Printed, *4d.* No Drawings.]

A.D. 1866, March 19.—N° 810.

GEDGE, WILLIAM EDWARD.—(*A communication from Emilio Musciacco.*)—(*Provisional protection only.*)—This is an invention of a steam dredging apparatus, which acts by suction. A steamboat containing boilers for generating the steam required for the operation, is employed in connection with a hopper boat. The main space in this latter boat, is covered over and made completely air-tight; a small tube and cock is fitted to the deck for the emission of air, and another small tube, which is furnished with a cock above the deck, and reaches to the bottom of the hold or hopper, is for the purpose of indicating when the internal space is filled with steam. The upper sides of the hopper boat are pierced to receive the bent ends of vertical suction pipes, which depend therefrom and reach towards the bottom of the river or water, where they are affixed by means of a strong flexible material, to the upper part of a hollow truncated cone, or a pyramidal frustum, which rests upon the bottom, one on each side of the vessel. When the hopper boat and apparatus are arranged in position, the hopper or internal space is filled with steam from the steam boat by means of a system of union junction pipes, capable of yielding to the motion of either of the boats; the air contained in the hold of the hopper boat, is expelled through the air tube, which is then closed, and when the issue of steam from the steam pipe indicates that the steam in the hopper boat has attained sufficient density, that pipe is also closed. After a while the steam in the hopper condenses and forms a vacuum, which causes suction and draws water and material up the suction tubes. At first the mud and small fetid particles rise, then the sand, and lastly portions of mixed gravel are drawn up the pipes into the hopper boat, which when filled, moves off to some convenient spot and discharges her contents through a trap valve in her bottom, which is opened and closed by a screw.

[Printed, 6*d.* Drawing.]

A.D. 1866, March 20.—N° 819.

RAMSBOTTOM, JOHN.—(*Provisional protection only.*)—This invention relates to generating steam, for the purpose of obtaining motive power. Two vessels are employed, conjointly or separately. One, which answers the purpose of a low-pressure boiler, is employed to heat the water and generate sufficient low-pressure steam to raise the heated water from the boiler into a valve chamber, wherewith to supply the "convertor" or second vessel, which contains numerous fire-tubes, and is made to withstand excessive pressure. This convertor is placed within the low-pressure boiler, from the furnace of which the flames and heated products of combustion are arranged to course through the tubes of the convertor on their passage to the boiler flue. The valve chamber contains a valve, a cavity in which alternately communicates with the boiler and the convertor, as the valve is moved to and fro by mechanism actuated by the engine. When open to the boiler, the cavity in the valve is filled with heated water, and when in communication with the convertor, the cavity by the movements of the valve is brought into coincidence with openings in the valve seat, through which the water is discharged. The convertor supplies the engine with steam, which after use is returned to the boiler, so that feed water is only required to make good the loss occasioned by leakage or escape.

[Printed, 4*d.* No Drawings.]

A.D. 1866, March 21.—N° 839.

NEWTON, WILLIAM EDWARD.—(*A communication from Andreas Herlöv.*)—*This is* an invention of a rotary steam engine, which consists of an outer cylinder, horizontally fixed or cast upon a foundation plate; the ends of the cylinder are closed by covers, which admit the main shaft to pass through the centre of the cylinder, within which fixed upon the shaft is another cylinder, which fits in steam-tight frictional contact between the internal surfaces of the covers of the outer cylinder, but is so much less in diameter than the internal diameter of the outer cylinder, that an annular space is formed between them. One half of this space is filled up by a semi-cylindrical metal block, attached by regulating screws to the outer cylinder. The ends of this block terminate in curves, which cause the radial movements of two piston slides, fitted respectively into deep longitudinal grooves, diametrally sunk along the opposite sides of the inner cylinder; these two piston-slides are united by bolts or rods, which pass and slide diametrically through the centre of the axis or shaft. Into the annular space, at each end of the fixed block, there is an opening for the admission of steam, and one at each end for the exhaust; these openings are governed by stop cocks. As the inner cylinder revolves in either one or other direction, the piston-slides by turns are diametrically actuated by contact with the corresponding curved end of the block, which forces the opposite slide (then passing the other end of the block and induction port) across the steam space, in time to receive the impulsion of the incoming steam, the force of which, by operating alternately on the piston-slides, gives continuous rotary motion to the inner cylinder and shaft, resistance to the steam in the other direction being provided by the end of the block.

[Printed, 8*d*. Drawing.]

A.D. 1866, March 22.—Nº 853. (* *)

CLARK, William. — (*A communication from Adam Scott Cameron.*)—“ Improvements in steam pumps.”

The first part relates to “ connecting the slide valve to a rod “ which connects with two pistons working in cylinders that are “ formed by the ends of the valve chest.” These cylinders con- “ nect by suitable channels with chambers which are situated in “ the cylinder heads and communicate freely with the cylinder, and “ from the outer ends of which suitable channels lead to the steam “ space of the valve chest. Said chambers are bored out to receive “ small piston valves, the stems or rods of which extend out into

" the main cylinder; and whenever the main piston approaches one " of the ends of its stroke, it strikes the stem of one of said " piston valves and throws open the communication between the " appropriate supplementary cylinder and the exhaust port." The second part relates to constructing the valves, which consist of discs provided with annular recesses filled with elastic material. " The valves and openings leading to and from the pump cylin- " der are so arranged, that by taking off the bonnet of the valve " chest convenient access can be had to all the openings, and the " pump can be readily kept in working order."

[Printed, 8*d*. Drawing.]

A.D. 1866, March 23.—N° 861.

WINANS, William Louis, and WINANS, Thomas.—This invention relates to apparatus for removing grease and extraneous matter from the interior of steam boilers and surface condensers. As applied to marine purposes each boiler is furnished internally with a pipe, the free end of which is bell-mouthed and turned up so as to appear a little above the surface of the ordinary water level; the other end of this pipe is connected to an ordinary steam trap, which prevents the passage of steam, but allows water to pass and be delivered overboard. The greasy and other matter which floats upon the surface of the water is received into the pipe, and by means of a cock discharged into the trap, and thence into the sea. By the same means the whole of the water contained in a boiler may be gradually changed. As regards surface condensers, an internal space or reservoir is left at the bottom of the condensing chamber to contain an accumulation of water, whereon the greasy particles which clog and obstruct the pump valves are found to float. The water is therefore drawn off by the working pumps from the bottom of the reservoir, and the greasy matter by means of a small pump, suitably arranged and worked by hand or otherwise. Accumulations of greasy matter are melted from the surface of the condenser tubes by throttling the flow injection water, in order that the tubes may become heated.

[Printed, 8*d*. Drawing.]

A.D. 1866, March 23.—N° 863.

AMOS, Charles Edwards, and ANDERSON, William.—This invention relates to a mode of recovering by evaporation the alkaline constituents of waste liquors from paper mills, and the obtaining a motive power therefrom. An arranged furnace, similar in construction to a blast furnace is employed. The liquor contained in a contiguous reservoir, is admitted in regulated quantities into a casing which surrounds the furnace, where, maintained at a fixed level, it is kept by the heat of the furnace in a constant state of ebullition, the bubbling foam as it rises, discharging itself through lateral openings into the furnace upon the top of the burning fuel. When it is desired to use the steam generated as a motive power, or for other purposes, the process is carried on in a closed furnace, under pressure, the air necessary to support combustion being forced in through tuyeres; the fuel is caused to descend through an arrangement of double valves or traps, and the liquor is forced in by a pump. If the furnace be open at the top, the heated vapour and gases of combustion will pass off into the atmosphere. The alkali will collect at the bottom of the furnace, and may after the space of twelve hours working, be removed with the remains of the fuel, and be further treated by lixiviation or otherwise, to separate the recovered chemical substances from the residuum ashes.

[Printed, 8*d*. Drawing.]

A.D. 1866, March 24.—N° 878.

NEWTON, Robert.—The objects sought by this invention, which relates to steam generators, are the more rapid generation of steam, the thorough combustion of the fuel, and diminution of smoke. Applied to an ordinary flued boiler, it consists in fitting to the front of the flue, beneath the furnace door, an air-tight chamber, which completely closes the entrance to the ash-pit, with which the chamber communicates. By means of a fan, a current of compressed air is forced through the chamber into the ash-pit underneath the furnace bars, and this air current is regulated by throttle valves. It is necessary that the ordinary chimney damper be more or less closed, at times to the extent of $\frac{7}{8}$ths of its area. An opening through the chamber is provided for the removal of s. The fuel is introduced through the fire-door in the usual nd care is required in the regulation of the air current in to the state of the fire. When applied to a two flued oth flues are fitted with the apparatus and respectively d by separate valves.

ted, 10d. Drawing.]

A.D. 1866, March 27.—N° 891.

WENNER, Carl.—(*Provisional protection only.*)—This invention relates to "steam turbines." "Two wheels are placed concen-
" trically, the one immediately above the other, each provided
" with buckets to form the steam passages. These said wheels
" are placed inside a cylindrical casing, in such a manner that
" the upper one is fixed to this said casing whilst the lower one
" is left free to revolve on its axis, which is made to protrude to
" the outside of the said casing to allow wheels, straps, or friction
" rollers for transmitting its motion. A suitable packing is pro-
" vided between the revolving wheel and the casing to prevent
" the steam from escaping. The steam when let into the machine
" passes first into the upper one of the said two wheels, where it
" receives its direction, and from thence on to the lower wheel, to
" which it transfers its motion in acting by means of its impetus
" on buckets of the said wheel, and then passes off either
" into the open air or into an exhauster as may be deemed
" proper."

[Printed 4*d*. No Drawings.]

A.D. 1866, March 31.—N° 923.

WHITE, George.—(*A communication from Pietro Monte.*)—(*Provisional protection only.*)—This invention relates to apparatus for indicating and registering on paper or other suitable material, the variations in the pressure and the working of the steam in engine cylinders. Two small cylinders, each containing a steam-tight working piston, are longitudinally fixed in opposite directions on a bed plate, so as to communicate respectively by means of suitable pipes and stop cocks, alternately with the steam above and below the working piston of the engine. Each small piston is thereby actuated by turns, and alternately returned to its normal position by the reaction of a spiral spring upon the rod of each. The extreme free ends of these rods are each furnished with a marking instrument, which rests upon the surface of the paper or material, to which a uniform forward motion is given by clock-work or otherwise, in a direction at right angles to the motions of the pencils or instruments, the configuration of the marks from which upon the paper or material, indicate the pressure and working of the steam in the engine cylinder.

[Printed, 4*d*. No Drawings.]

A.D. 1866, April 6.—N° 990.

CHESTERS, John.—(*Provisional protection only.*)—This invention, relating to the construction of furnaces for the prevention of smoke, consists, as applied to a Cornish boiler, in forming by means of a transverse water-space partition at the back of the fire-bars, a vertical channel the whole width of the fire-grate. The partition first rises vertically and then inclines forward towards the front of the furnace. Two other transverse water-space partitions are placed in the boiler flue, one, which transversely divides the upper part of the flue, is disposed immediately behind the first named partition, and the other beyond, transversely dividing the lower part of the flue, and leaving sufficient draught space from the furnace. The air necessary to support combustion passes through the ash-pit, and rising up the vertical channel between the water space and the grate bars, is depressed and directed over the surface of the fire by the horizontally inclining part of the first partition, over which, mingled with the flaming and other products of combustion, the hot draught passes on to the partitions in the flue at the rear of the furnace, and passing through the tortuous passage formed thereby, and through a contracted part of the flue beyond, finally reaches the chimney shaft free from smoke.

[Printed, 4*d*. No Drawings.]

A.D. 1866, April 9.—N° 1006.

THOMSON, Robert William.—This invention, relating to steam gauges, is also applicable to other pressure indicators. Several modifications are shown and described. The first is represented as attached to the end of a steam boiler, and consists of an ordinary flat circular box, with dial plate and glass front. Projecting from the centre of the back of the case, there is a supporting tube, within which rests a helically twisted hollow ribbon or flattened tube of brass or other material. The extreme end of this twisted tube is soldered or fixed to the end of the steam pipe, which by means of a syphon bend in the pipe, contains water condensed from the steam. This water, by the steam pressure, is forced into the twisted hollow of the tube, the front end of which is closed, and free to untwist when the flattened tube is distended by the pressure within. The dial finger is fixed on this free end of the twisted tube, the reaction of which, as the pressure declines, gradually carries the finger point back to zero, its normal position. This latter return action is due to the elasticity of the twisted tube; but the untwisting of the tube, whereby the finger point is carried up the graduated scale of the index plate, is caused by the longitudinal pressure of the steam.

[Printed, 8*d.* Drawing.]

A.D. 1866, April 12.—N° 1038.

BOND, William.—This invention relates to the slide valves and reversing gear of steam and other engines. 1st, consists in an arrangement for relieving slide valves from back pressure, for which purpose the back, as well as the face and the two sides of the valve, are got up to true surfaces parallel with each other. A short hollow piston is fitted into a circular opening formed in the back of the steam chest. The bottom of this piston, which is got up to a true surface, rests upon the back surface of the slide, through openings in which the steam passes into the cylinder from the hollow piston, each time that a slot through the bottom surface of the piston, and either one or other of the ports into the cylinder, and the openings through the slide, are alternately brought by the movements of the latter, into coincidence, the steam inlet being through the cylinder cover and above the piston, which is suitably furnished with annular steam-tight packing, and with regulating stops to maintain it in position. 2ndly, for the purpose of reversing motion, a long transverse slide, furnished with suitable ports and passages, is arranged beneath the main slide valve for changing the direction of the steam to either side of the piston as required, the induction and eduction ports and passages being suitably arranged to correspond in relation to either one or other position of the slide, which operates without regard to the working of the main slide valve, the pressure upon which is counteracted by admitting steam to the face of the transverse slide.

[Printed, 8*d.* Drawing.]

A.D. 1866, April 13.—N° 1047.

CHATWOOD, Samuel, and STURGEON, John.—This invention, for the obtainment of motive power, relates, 1st, to the employment of atmospheric air saturated with water, or low-pressure steam, or either water or air separately, the heat being applied and the elastic force developed within the working cylinder of the engine by means of electricity. For this purpose is employed an ordinary engine cylinder, which instead of the usual arrangement of valves, is provided with a cock at each end; the cocks being opened and closed alternately, as the piston arrives at each end of its stroke, admit jets of water in the form of fine spray, which is distributed over coils of platinum wire, heated by the electric current and disposed within the ends of the cylinder, or attached to the faces of the piston. By these means steam is by turns simultaneously generated in the ends of the cylinder of sufficient elastic force to impel the piston through its alternate strokes, the opening and shutting of the cocks and the directing of the electric currents being effected by suitable arrangements connected with the to-and-forth motions of the piston. 2ndly. When supplying water or other fluid for generating the elastic force, either in the ends of the working cylinder, or in a separate generator, the invention consists in causing the governor to regulate the action of the pumps, and consequently the quantity of fluid required in relation to the normal speed of the engine. 3rdly. Providing means for the escape of the elastic medium when the pressure exceeds the fixed maximum, and 4thly. Employing vessels, composed of copper or its alloys coated with platinum, when producing and using superheated steam.

[Printed, 8*d*. Drawing.]

A.D. 1866, April 13.—No. 1054.

HAWDON, William, HAWDON, William March, and HEATHER, Henry.—(*Provisional protection only.*)—This invention, relating to distributing-valves for steam and other engines, consists, when applied to engines of the oscillating class, " in having the cylinder steam ways or ports brought out to a " surface arranged concentrically with one of the trunnions; " fitting steam tight against this surface is another surface having " corresponding passages cast thereon for the inlet and exit of " the steam or other motive principle from each of the cylinder " ports. As the cylinder oscillates backwards and forwards the " ports or passages cast thereon are brought into communication " *with the above* inlet and exit ports alternately. In adapting

" this invention to stationary cylinders it will be seen that motion " will have to be communicated to the face containing the inlet " and exit passages, and that the steam pipe and exhaust pipe " if required will have to adapt itself to this movement. The " motion may be reversed at any time if required by four-way or " other cocks, slides, or any well-known means causing the motive " principle to enter by the former exit and exhaust by the former " inlet."

[Printed, 4*d.* No Drawings.]

A.D. 1866, April 13.—No. 1055.

GRESHAM, James.—This invention relates to apparatus for raising and forcing liquids, it being applicable to the "Giffard " Injector."

1st. To self-adjusting injectors, where the suction of the jet when the water supply is deficient, or the overflow when it is in excess is, as in the case of A. V. Newton's Patent, of date April 12, 1865, No. 1051, made so to act as to adjust the supply of water by means of a cock, which allows the fluid to be discharged until the jet is fully established, and two valves are used, one to prevent the driving back of the water or steam, and the other to allow its escape and show when the injector is not working. At starting the cock is turned by hand.

The object of the present invention is so to simplify the self-acting injector, that it may be started by simply turning on the steam, which is effected by one self-acting cock or valve, and the cock and two valves described in A. V. Newton's Specification are dispensed with.

This self-acting cock or valve is so arranged "that when the " injector is not at work the valve will be open, and so that the " pressure or force developed when the jet is fully established " will close the valve, the injector pressure when it is in operation " being in excess of that in the boiler, and vice versa when the " injector is not at work, as then there is no injector pressure. " The ordinary valve used to prevent the return of the water from " the boiler is shut when the injector is not working and open " when it is working, and one method of carrying this part of my " invention into effect is to connect the ordinary valve with another " valve, so that when one is open the other will be shut. To " make this arrangement act with certainty the outlet valve for " allowing of the escape of the fluid till the jet is established will

" have to be of the kind known as equilibrium." Other plans are devised for practically developing this part of the invention.

2nd. " Relates to ordinary injectors and others having orifices " for overflow or for starting the injector into operation, and " consists in closing the overflow orifice to prevent loss of water " or the suction of air, or in dispensing with such orifice by " combining with such injectors a self-acting outlet valve for " overflow when starting the injector, actuated and arranged as " first described.

3rd. Relates to the construction " of injectors generally and " also to such as are adapted for feeding boilers where there is " little variation in the pressure of the steam."

[Printed, 1*s*. Drawing.]

A.D. 1866, April 14.—No. 1059.

JORDAN, John.—(*Provisional protection only.*)—This invention relates to steam boilers, and consists in so fixing a " chemise " or hood over the fire-box flues or tubes, within the water space, that a thin portion of space is left between the underside of the hood, and the surfaces over which it is applied, the top of the hood being open and reaching up to, and slightly above the water level. The heat passing from the fire through the protected surfaces, causes an upward circulation of the water within the hood and an overflow at the top, and with this movement of the water, is carried all the particles of floating matter, which falling over the upper edge of the hood are deposited in the body of the water outside, and gradually sink to the bottom of the boiler, whence they are periodically removed in the ordinary manner. In some cases the metal composing the hood may be made to serve as internal stays for supporting and strengthening the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1866, April 16.—No. 1076.

HARRIS, James.—(*Provisional protection only.*)—This invention relates to a composition for preventing incrustation in steam boilers. The inventor says:—" I take the bark of the oak tree, " and to every 50 lbs. weight thereof add about 25 gallons of " water, and boil the same together for about two hours, then " draw off the liquor and mix with the bark a further quantity " of 15 gallons of water, boiling them together for another two " hours, then draw off the liquor as before and add another 15

" gallons of water to the bark, boiling the same together for " another two hours. The three boilings are then put into one " vessel and submitted to gentle heat. I then proceed to add " to every 20 gallons of the liquor about one pound by weight of " isinglass or other gelatinous matter, keeping the whole well " stirred until the isinglass is thoroughly dissolved; I then strain " the liquor through a hair sieve into vessels suitable for keeping " or transport to purchasers." Where the water in a boiler is used for manufacturing purposes, valonia, in the proportion of 50 lbs. weight to 50 gallons of water, boiled for three hours, is substituted for the oak bark, 50 gallons of fresh water being used to each boiling, and one pound of isinglass to every 20 gallons of the liquor produced.

[Printed, 4*d.* No Drawings.]

A.D. 1866, April 16.—N° 1077.

CUTHBERT, WILLIAM.—(*Provisional protection only.*)—This invention relates to steam whistles, and "consists in carrying " through the crown of the bell and through the tongue a rod, " the lower end of which carries a valve which is kept raised " either by a spring or by the pressure of the steam; the upper " end of the rod extends a short distance above the crown of the " bell, and a lever which is hinged to an upright supported by an " arm carried out from the crown bears upon the top of the rod. " When it is required to sound the whistle the lever is pressed " down by hand or otherwise, so as to force down the rod and " thereby open the valve, the steam is then allowed to escape " through the ordinary aperture and sound the whistle."

A double toned whistle is produced by interposing between the mouth of the bell and the cylinder, a flat cylindrical ring of the same diameter as the bell, which, by means of a spring, is kept up about a quarter of an inch above it. In this position, when the valve is opened, an ordinary whistle is produced, but by means of another lever which presses the edge of the bell upon the edge of the cylindrical ring and so closes the interspace, at the same time opening the valve, a duller or less shrill whistle is sounded.

In addition to being able to sound these whistles in the usual way by hand, communication with them may be established from the guard's van by means of wires.

[Printed, 4*d.* *No Drawings.*]

A.D. 1866, April 18.—No. 1090.

MARSHALL, James.—This invention relates to heating feed water, the apparatus for which is introduced into the smoke box, or the uptake of a locomotive or multitubular steam boiler, and arranged so as to receive both the heat from the exhaust steam, and the heat from the products of combustion as they pass onwards to the chimney. The form of the apparatus may be varied to suit the configuration of the smoke box or uptake wherein it is to be applied. It consists "of a hollow vessel with " double sides in order that the exhaust steam may be received " into and heat the interior of such vessel, the exterior of the " vessel being at the same time heated by the products of combustion passing from the flue tubes into the smoke box or " lower part of the chimney of the steam boiler, whilst the water " passing to the boiler is contained between the double sides of the " vessel. It is desirable that the water should not pass directly " through the space between the double sides of the vessel, but " that partitions or stops should be formed therein to cause the " water to take an indirect or zig-zag course through the water " space."

[Printed, 10*d.* Drawing.]

A.D. 1866, April 20.—No. 1113.

WADDELL, Charles James, and MUIR, Hugh Cameron Bell.—(*Provisional protection only.*)—This invention relates to steam and other valves, which are made fluid-tight by the use of vulcanized or other compound of india-rubber, as a medium between the lid or the seating, such medium being attached to either one or the other. A ring of india-rubber is sprung into a recess in the casing, and acted upon by a metal lid, whereon an india-rubber cushion can be placed to act against the guard, and so prevent concussion. When used as a double valve, a recess in the lid contains a second india-rubber ring to be acted upon by a ball of glass, porcelain, or other substance, or by a second lid, the guard of which forms a guide to the first. In some cases the seat, casing, and guard are made of india-rubber, and a ball of glass or other substance is used to act as the lid.

Various other combinations are described.

[*Printed, 4d.* No Drawings.]

A.D. 1866, April 21.—No. 1129.

NEWTON, Alfred Vincent.—(*A communication from Addison Calvin Fletcher aud John Hughes.*)—This invention relates to the construction of grate-bars for steam boiler furnaces, and for other closed and open fire-places. These bars are arranged in groups, each group forming one of a series of steps, one above another, with air passages so arranged through the flat transverse plates which form the fronts or rising parts, that air, which is heated in its passage through, is delivered over the surface of the fuel on the steps below, so as to inflame the combustible gases. Each group of bars forms a separate grating, held together transversely with ordinary air passages formed by corresponding projections on the sides of each bar. The steps or grate surfaces may be variously arranged to suit different kinds and forms of furnaces, either longitudinally, transversely, or if radiating from a centre, the highest part of the grate surface should be there. For stoves circular grates may be made entirely of one casting, and other arrangements are described to suit different kinds of furnaces.

[Printed, 8*d*. Drawing.]

A.D. 1866, April 23.—N° 1146.

HUCH, Edward Heinson, and WINDHAUSEN, Francis Joseph.—This invention, relating to a motive-power engine, to be worked by steam or other fluid, consists of an ordinary steam cylinder, which is mounted and caused to revolve on its transverse axis or trunnions, which project respectively mid length from the two sides, and rest in suitable bearings. The axis on one side of the cylinder is hollow, and contains the steam ways which communicate with the two ends of the cylinder, the steam admission valves being arranged to cut off and work the steam expansively; the opposite trunnion or axis gives off the power. Within the cylinder there is fitted a heavy weight or piston, having no piston rod, and packed to slide steam tight to and fro from end to end of the cylinder. When the engine is at rest, the cylinder is placed in a vertical position by the piston weight, which sinks to the lower end of the cylinder vertically beneath the axis. Upon the steam being admitted under the piston, the latter is raised to the upper end of the cylinder, which being inclined in the desired direction of motion, so as to bring the weight on one or other side of the vertical plane of the axis, acts as a weighted lever, and causes the cylinder to perform half a revolution, just before the completion of which the steam is again admitted to the lowest end, and the piston is again raised to the end which is uppermost, which in turn is brought down by the weight. By these means constant rotation of the cylinder is maintained. Suitable provision is made in the ends of the cylinder, to receive and check the terminal momentum of the piston at the end of each successive upward course, and an apparatus for measuring exactly the quantity of steam required for each successive lift or stroke is introduced in the steam pipe. Modifications are shown and described.

[Printed, 1*s.* Drawing.]

A.D. 1866, April 25.—N° 1161.

CROSLAND, James Stead.—(*Provisional protection only.*)—This invention relates to a mode of compounding steam engines, and "consists in combining and arranging two cylinders, each of "the same capacity, stroke for stroke, or cylinders of different "capacities and speed of piston, if the product of the capacity "multiplied by the speed of the piston is equal, or nearly so; or "in combining and arranging two cylinders where the said product "of capacity and speed of piston of the first shall slightly exceed "that of the second cylinder into which the steam enters, so that "high-pressure steam will be conveyed to the first cylinder, and "therein expanded by cutting off the supply of steam before the "completion of the stroke of the piston, the expanded steam then "passing from the first to the second cylinder, in which the "valves are arranged, so that the steam can enter the cylinder "during the entire stroke of the piston, or nearly so, from which "cylinder the steam may be exhausted into the atmosphere, or ". . . into a condenser connected with an air pump worked "by the engine or other (independent) power." Existing steam engines, having cylinders of equal capacity, and working stroke for stroke, will, when compounded, require no alteration in the cylinders or gearing.

[Printed, 4*d.* No Drawings.]

AD. 1866, April 27.—N° 1181.

MARSHALL, Thomas.—(Provisional protection only.)—"Apparatus for supplying water to steam boilers."

Between the tank or cistern which supplies the feed water, and the boiler, there is a small closed vessel, which communicates respectively by means of separate pipes and stop cocks with the feed water cistern, whence it is filled, and also with the boiler, into which the water is discharged. Another pipe forms a communication between the steam space in the boiler and the upper part of the vessel, wherefrom, when the steam from the boiler is admitted, the water is expelled by the steam pressure, and caused to flow downwards into the boiler. If preferred, a piston may be fitted in the intermediate vessel, upon which the pressure of the steam may be directed instead of upon the surface of the water, whereby condensation would be prevented. By means of a steam branch pipe the steam may be used to raise the piston, or a lever may be used for that purpose.

[Printed, 4*d.* No Drawings.]

A.D. 1866, April 27.—N° 1184.

TAYLOR, JOSEPH.—(*Provisional protection only.*)—This is an invention for "increasing the expansive power of steam," the object being to economize fuel in obtaining steam for the production of motive power by the introduction, into steam boilers, of atmospheric air by means of a force pump. The pump rod is actuated by a lever and connecting rod attached to the beam of the engine, the air being driven through a pipe communicating with the boiler, and a suitable back pressure valve provided to stop the reaction upon the pump. It is stated that the introduction of air into boilers to mingle with steam generated from water "greatly reduces the amount of fuel necessary to obtain the "required power or pressure of steam."

[Printed, 4*d.* No Drawings.]

A.D. 1866, April 27.—N° 1197.

BRAY, EDWIN, and HARGREAVES, JOHN CROSBY.—This invention of apparatus for the prevention of boiler explosions "is "applicable to any class of boilers, and consists in affixing over "the furnace a small chamber made of brass or other suitable "material, and fitted with a conical valve (by preference). To "this valve is connected a lever of the first order, having its ful-"crum on a projection extending from the valve chamber. The "end of the longer arm of the lever may be of a 'fork' or "'*cross*' *formation,* and is so cranked or otherwise relatively to

“ the seat of the valve that an ordinary water float (having a “ guide spindle passing, if desired, into a locked chamber on the “ top of the boiler) fitted in the usual manner may fall upon it “ and depress it, thus opening the valve and admitting steam “ into the furnace when the water has become too low. The fire “ having been extinguished and the steam exhausted, a spring “ affixed near to the fulcrum, and under the longer arm of the “ lever, restores the valve to its normal position. In order, how- “ ever, to meet the exigencies of those cases where although the “ water is not too low, the steam is at an unusually high pres- “ sure, still using the apparatus before-named, we extend the “ shorter arm of the lever and form a hole in the extremity of the “ same capable of receiving a connecting rod, depending either “ from a spring pressure gauge affixed to the top of the boiler, “ or the lever of an ordinary safety valve. The maximum steam “ pressure therefore being decided upon, and the gauge or gauges “ having been fixed in accordance, any excess of pressure elevates “ the conical valve, and also the safety valve when the two are “ connected by means of the connecting rod before named, the “ effect being as in the first instance.”

[Printed, 10*d*. Drawing.]

A.D. 1866, April 28.—N° 1200.

THOMSON, David.—This invention relates to steam boilers containing one or two furnaces, the object being to increase heating surface within a limited space. The shell of the boiler consists of a short horizontal cylinder of large diameter, fitted with an internal furnace flue, the diameter of which diminishes slightly towards the back of the boiler, in order to facilitate its easy removal when required for repairs. A double range of furnace bars, which nearly occupy the whole length of the boiler, abuts against a fire-brick bridge, behind which, within a few inches, the end of the flue is closed by a thick fire-brick partition, containing numerous holes or passages, through which the flaming and other products of combustion pass into a fire-brick smoke chamber built against the back end of the boiler; thence the hot draughts return through numerous flue tubes to a smoke box over the furnace door in front, and return again, by means of larger tubes extending through the steam space from front to back, into the chimney flue, wherein jets of steam taken from the boiler are directed from suitable nozzles to hasten the draught.

The boiler is surmounted by a large steam dome, the passage into which is through an upright branch of a perforated pipe longitudinally disposed in the upper part of the steam space. For marine boilers the form of the smoke box or uptake at the back of the boiler is modified.

[Printed, 10*d*. Drawing.]

A.D. 1866, April 28.—N° 1206.

NEWTON, Henry Edward.—(*A communication from Marie Joseph Denis Farcot and Joseph Perrigault.*)—This invention relates to "apparatus for obtaining a continuous rotary motion " by the direct action of steam, gas, or other elastic fluids on a " wheel, the object being to cause the steam to expend the whole " of its elastic force on the wheel before making its escape from " the cylinder or casing. For this purpose the steam or other " motive fluid is caused to act upon a wheel provided with floats, " which are, by preference, set at an angle to the periphery of the " wheel. The steam or other motive agent is supplied to the " cylinder or casing through a pipe situate at the side, and enters " the spaces between the floats and acts upon them and passes into " a steam chamber at the other side of the cylinder or casing, from " whence it again passes between and acts upon the floats and " into another chamber in the opposite side of the cylinder or " casing, and thus the steam passes in a continuous serpentine " direction throughout or across the whole periphery of the cylin- " der or casing, entering chambers provided alternately at each " side of the casing, and acting successively upon the floats, thus " imparting to the wheel a steady screw-like motion, and causing " the steam to act expansively throughout the whole of its passage " to the exit pipe." Various modifications are exhibited and described, relating to different arrangements and position of the floats and steam channels on the periphery of the wheel, the mode of packing so as to render the frictional joints steam tight, the entrance, direction, and escape of the steam, mode of supporting the apparatus on antifriction rollers, and giving off the power.

[Printed, 1*s*. Drawings.]

A.D 1866, April 28.—N° 1210.

BEGG, William.—The object of this invention, relating to furnaces *and apparatus* connected therewith, consists in facilitating the combustion of smoke, and preventing the entrance of cold air into the flues during the act of firing. The invention is chiefly applicable where two furnaces are employed, and is shown and described as applied to a steam boiler with internal furnaces and two flues. Behind the bridge of each furnace is fitted a door or damper of sufficient size to close their respective flues; these doors are so connected by means of rods and levers respectively to the furnace doors, that when the doors are opened the bridge dampers simultaneously close, and shut off the communication with the chimney. At or near the front of the furnaces there is a flue passage or communication leading from one furnace to the other. The fires are replenished with fresh fuel alternately, the state of one fire approaching incandescence when the other is newly fed, during which time, and so long afterwards as the door remains open, or the damper remains closed, the thick smoke from the fresh fuel will pass through the flue passage into the other furnace, and there becoming inflamed by the incandescent fire will be consumed. The connection between the dampers and their respective furnace doors may be so arranged that the former may remain closed for some time after the latter are shut, and then may be opened gradually.

[Printed, 10*d*. Drawing.]

A.D. 1866, April 28.—N° 1212.

PEARCE, JOHN CHARLES.—This invention relates to steam engines and boilers, and consists, for the purpose of increasing the efficiency and power of a steam engine, in fixing in any convenient position additional auxiliary cylinders, in close proximity to the crank. As applied to an ordinary stationary beam engine, exhibited by one of the modifications, it is preferred to invert the cylinder, and connect the piston rod to one end of a lever or beam, the other end of which works upon a stud fixed to the foundation, a suitable distance below the crank shaft, the power of the auxiliary cylinder being given off at an intermediary point of the lever on to the same crank pin by means of a connecting rod. The capacity of the auxiliary cylinder may be less than the main cylinder and exhaust into it, or it may be considerably larger, so as to work the steam to its terminal expansion in connection with the condenser. The valves are of the ordinary construction. The her parts of the invention relate to other modified arrangements for compounding high and low pressure auxiliar cylinders, and to the application of a condenser and air pump in connection therewith. Also combining and arranging the auxiliary cylinder in connection with a fly wheel and crank, so as to constitute an independent engine. Also imparting to the metallic packing rings of pistons, the requisite vertical and lateral pressure for maintaining them in steam-tight contact, by the use of a series of springs and angular-shaped blocks, and to the manufacturing of hoops and rings, for strengthening the flues and fire-boxes of steam boilers, and for other purposes, such hoops and rings being formed during the process out of annular blooms, and finished by rolling or hammering. The Specification of a prior Patent granted to this inventor, bearing date 22nd May 1856, is referred to.

[Printed, 2*s*. Drawings.]

A.D. 1866, May 1.—N° 1227.

DAVIES, George.—(*A communication from William Schaubel.*) —This invention relates to the construction of steam boilers, which consist of a cylindrical outer shell of the vertical class, covered in by a hemispherical top, which forms the steam space, concentrically through which the chimney flue rises and communicates with a chimney on the centre of the dome, and extending a suitable height above the boiler. The furnace, surrounded with water space, is externally attached to one side of the shell, the cylindrical part of which is filled with a winding narrow flue in the form of a volute scroll, the termination of the outer coil thereof communicates with the furnace, whence the flaming and other products of combustion, after coursing in succession through the inner convolutions of the flue, which are separated by water space, enter the central flue and pass upwards therein through the steam space to the chimney. Between the flat bottom of the boiler, and the bottom of the winding flue, there is sufficient space left for water, and also sufficient depth above the top of the flue and the working water level; also side flue tubes are arranged in the furnace for conveying the hot draughts direct from the front into the winding flue, for the purpose of preventing accumulations of partially consumed fuel in the front corners of the furnace.

[Printed, 6d. Drawing.]

A.D. 1866, May 1.—N° 1230.

LEWIS, Joseph.—This invention relates to valves for regulating the flow of steam, water, and fluids.

According to one modification as stated, it " consists in an " arrangement whereby I am enabled to rotate or oscillate the " valve upon a centre of motion. To accomplish this I use a " cylindrical valve rotating or oscillating within a casing. In this " casing I form the ports, and the inlet and exhaust passages in " the moveable part. The valve is separated for one arrangement " in two parts by an annular groove, from which there are other " grooves in the direction of the axis, but not extending through " the entire face of the valve. The steam is admitted to the " annular groove and passes into the axial grooves above-men- " tioned, and from thence through the ports in the casing as the " rotary motion brings them coincident. For the exhaust I form " openings diametrically through the valve at right angles to the " grooves formed for the inlet, and which discharge through the " centre. The centre of motion of the valve is placed excen- " trically to the line of ports. The valve so constructed I apply " to steam and other fluid engines, and to meters for measuring " water and other fluids. If it be desired to use the valve for " admitting the fluid to one side only of a piston, then one-half " of the above-described arrangement is used."

Adaptations of the valve as applied to a single cylinder and to two cylinders are described, also to water meters in conjunction with metallic pistons, flexible diaphragms, or other ordinary arrangement.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, May 2.—N° 1240.

DAVIES, George. — (*A communication from David Greene Haskins.*)—(*Provisionl protection only.*)—This invention relates to the use of gas or inflammable fluids for heating the boilers of locomotive and other steam engines, to the plan of construction, and to the apparatus employed. Extending longitudinally through the boiler " are two or more tubes or flues, in each of which is " arranged a series of small longitudinal gas pipes provided with " apertures or burners placed at intervals throughout their entire " length. These pipes are to be supplied with gas from a tank

" or reservoir, to which they may be connected in any convenient " manner. To the under side of the longitudinal tubes or flues " are secured pipes passing through the lower part of the boiler, " and open at both ends for the admission of air to the said tubes " or flues to assist in the combustion of the gas. To the upper " side of the said longitudinal tubes or flues are attached other " pipes passing upward through the boiler for the escape of the " consumed gases or products of combustion. On the outside of " the boiler is also arranged a series of gas pipes, having apertures or burners, and placed longitudinally as near to each " other and to the outer surface of the boiler as may be found " expedient. Surrounding the boiler and the outer series of gas " pipes is a casing or jacket for the protection of the flame of the " said pipes, which casing may be either formed of a single thickness of metal plate, or it may form a water jacket, and may be " connected with the boiler in any convenient manner. A series " of gas pipes may also be placed at each end of the boiler and " similarly protected by an external casing."

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 2.—N° 1251.

FEASEY, George.—(*Provisional protection only.*)—This invention relates to a composition for removing and preventing incrustation in steam boilers, which consists mainly of carbonate of soda and common salt, to which may be added, a small quantity of borax, and sometimes sal ammoniac, or hydrochlorate of ammonia. These ingredients are to be well mixed together and either made up into a paste with soft soap, or boiled with water. A good result in the prevention of incrustation may be obtained from 80lbs. of carbonate of soda, mixed with 14lbs of salt, 2lbs. of borax, and 14lbs. of soft soap. If required for immediate use, the compound may be boiled in 10 or 20 gallons of water, and for removing old incrustation, it is recommended that 10 lbs. of sal ammoniac be added to the other ingredients.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 2.—N° 1253.

BOTTERILL, John.—This invention of apparatus for causing the consumption of smoke, consists " in arranging cast-iron or " other pipes or air passages in combination with an air chamber

" or hollow bridge placed in the flue, fire-box, or other most con" venient part of the furnace where it may be exposed to the " heat of the fire, the object of the invention being to admit heated " air to the fire-box and cause it to commingle with the combus" tible gases evolved from the fuel for the purpose of more " effectually burning the same. In adapting the invention to " locomotive engines the air supply pipes or passages are so con" structed and arranged as to admit the air at either end so that " in whichever direction the engine is travelling the air will be " conducted to heating apparatus, and will be supplied under " pressure to the fire-box, in which it will commingle with the " combustible gases. In connection with these air pipes or pas" sages is a hollow box or chamber to receive the air after it has " passed through the pipes or passages; or the pipes may be let " into a hollow part of the bridge, or be adapted to or placed " contiguous to the bridge of the furnace. The air in traversing " through the pipes or passages and the hollow box or chamber " becomes heated to a very high temperature, and when it enters " the fire-box and commingles with the heated combustible gases " and smoke it will effectually consume the same, and thereby " greatly economize the fuel."

[Printed, 1s. 4d. Drawings.]

A.D. 1866, May 4.—N° 1277.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from Merrick Mortimer Barnes.*)—This invention relates to machinery for " converting reciprocating into rotary motion by means of one " or more jointed arms pivoted to a shaft and acting upon the " interior surface of a drum or pulley, each arm being furnished " with a presser foot and operated through a rod or its equiva" lent by the motive power." A fly wheel is mounted on a shaft to which rotary motion is communicated. On one side of the wheel concentrically fixed to the arms, is a strong broad annular rim, the inside surface of which is parallel with the axis. Loosely mounted upon that part of the shaft which is enclosed by the rim, there are two short arms, each in length somewhat more than half the radius of the internal diameter. To the free end of each arm is jointed a short link, and to the outer end of each link is jointed *foot*, the broad sole of which fits internally to the circumferential *rve of the* rim, the length altogether of the arm, link, and foot;

measuring somewhat more than the radius, so that when the centres, which cannot be brought into a line, approximate to that position, the feet which are supported by springs are forced against the rim. Jointed to the end of a steam engine piston rod, or other reciprocating moving power, are two connecting rods, the outer ends of which diverge, and are turned to a right angle, so as to form respectively the joint pins which unite the two short arms to the links diametrally on each side of the shaft. The alternate reciprocating motions of the piston rod or lever, cause the feet to press and act by turns against the rim on the wheel, which is forced round thereby.

[Printed, 1*s*. Drawings.]

A.D. 1866, May 5.—N° 1280.

CRISPIN, William Henry.—(*Provisional protection only.*)—This invention relates to a steam roller adapted to agricultural operations. The roller consists of a (by preference) wrought-iron cylinder of any desired diameter, and furnished internally with one or more annular toothed racks or gearing. A steam boiler and engine, of the requisite size and suitable construction, are suspended from a shaft fixed to or working in suitable bearings respectively placed at the ends of the cylinder. The engine actuates a toothed wheel which works into the annular gearing and causes the cylinder to revolve, and roll along the surface of the ground, in a direction regulated by the motion of the wheels. Instead of one cylinder, two or more may be connected to form a roller, in which case the guiding and turning may be effected by giving a suitable revolving direction to the cylinders respectively, each being provided with annular gearing acted upon by suitable toothed wheels, in connection with apparatus for throwing them severally in and out of gear, and for changing the direction of motion. A trailing wheel for steering the roller, may be adapted thereto.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 5.—N° 1286.

BRICKNELL, Augustus Lea.—(*Provisional protection only.*)—This invention relates to a rotary engine which when actuated by steam or fluid pressure will give off motive power, and when driven at the axis by other power, will act as a pump or meter.

It “ consists of a cylindrical chamber in which is fitted a cylindrical centre piece fixed on an axis. The centre piece carries “ two pistons disposed radially therein, and at opposite points of “ the diameter. The axis and centre piece are concentric with “ the cylindrical chamber in which the centre piece is disposed, “ said centre piece having disc or flange-like ends which fit the “ internal diameter of the chamber. The annular space between “ the flange ends constitutes the space or chamber in which the “ steam acts on the pistons to carry them round; at one point “ in the circumference of the cylindrical chamber a steam abutment or partition is disposed; this abutment is fixed to the “ cylinder and extends towards the axis of the centre piece, “ against the periphery of which it has contact, as also with the “ insides of the flange ends, thereby forming a fixed partition “ across the annular steam space,” on the opposite sides of which, two ports, according to the desired direction of motion, act respectively for either the induction or eduction of the steam. The sliding pistons “ are fitted in the body of the centre piece to “ slide towards and from the axis, and also between the flanged “ ends before-mentioned, grooves or recesses being formed therein “ for their reception; studs project from the sides of the pistons “ . . . . and pass out at slots in the sides of the rotating “ centre piece; these studs are fitted with truck rollers, which “ run upon a fixed cam or cams attached to the flat sides of the “ cylindrical chamber or cylinder, or other stationary part. The “ same cam operates both pistons.

“ The steam being admitted between the abutment and a piston “ the centre piece is forced round thereby, the piston in advance “ at the same time begins to recede, and by the time it arrives at “ the abutment it has receded within the body of the centre; in “ its further progress it again gradually comes out, and by the “ time another quarter of a revolution is complete is fully extended and bears against the interior of the cylinder, and “ intercepts the steam from the piston in advance, which contracts “ or draws in in like manner, and so keeps up a continuous “ motion of the machine.”

To render the diverging movement of the pistons more free, steam is admitted into the recesses to act divergently upon their inner ends; it also has the effect of maintaining steam-tight, the frictional contact between the outer ends of the pistons, and the internal circumferential surface of the cylindrical chamber.

[*Printed, 4d.* No Drawings.]

A.D. 1866, May 7.—N° 1293.

MILNER, JOHN.—(*Provisional protection only.*)—This invention relates to that description of steam engine expansion gear, by which the slide valve is actuated by a link motion, and the expansion effected by a cut-off plate working on the slide valve. The rod of the cut-off plate is connected with an adjustable sliding block, which works independently of the slide valve block either in the link itself, or in a separate groove attached thereto. The relative positions of the two blocks, determine the requisite variable motion of the cut-off plate in relation to the main slide, and consequently the point in the stroke at which the steam is to be cut off for expansion.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 7.—N° 1302.

GREEN, THOMAS.—(*Provisional protection only.*)—This invention relates to the construction of vertical steam boilers. The shell of these boilers is cylindrical, containing a conical fire-box, the base of which is nearly equal in diameter to the shell of the boiler. The chimney flue, which is contracted at its junction on the top of the furnace, is carried up through the water and steam spaces above, and opens into a short chimney which is supported on the top of the boiler. The fire-bars form the bottom of the fire-box. Horizontal water-tubes, of comparatively large diameter, run through the fire-box, and communicate through the sides with the surrounding water space; these tubes serve to increase heating surface, and act as stays. It is preferred to mount the boiler on a cast-iron hollow bed plate, in which the ash-pit is formed, and the feed water heated.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 8.—N° 1304.

ATKINSON, MATHEW HUTTON.—(*Provisional protection only.*—This invention relates to an arrangement of circular reciprocating distributing-valves, suitable for steam and other engines, with either oscilating or fixed cylinders. As applied to one of the oscillating class "the ports are made on the face of the cylinder " concentric with the axis of oscillation, and the valve, which may " consist of a disc or portion of a disc made hollow, is caused

" to fit tight against the valve face on the cylinder, and is pro-
" vided with an inlet port or opening passing through it from
" front to back, and is further provided with exhaust ports
" opening from the front or face only to the hollow chamber or
" internal cavity of the valve. This hollow chamber opens either
" direct into a central exhaust pipe or hollow spindle or stem,
" which also serves as the axis on which the valve turns when
" adjusted for reversing the engine, such adjustment being
" effected by a reversing lever attached to the said hollow or
" tubular stem, or into an opening communicating with a belt
" cast in the cylinder, in which case the spindle for reversing
" the valve will be solid, or if hollow will be so only for the con-
" venience of manufacture." When applied to a fixed cylinder, the lever referred to may be employed to impart the necessary motion to the valve by means of excentrics. The valve is contained within a steam chest.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 8.—N° 1308.

IRELAND, WILLIAM.—(*A communication from August Heinrich Cornelius Bachmann.*)—This invention relates to drying steam, and separating water therefrom. The apparatus is interposed in the steam pipe, so that the steam on its passage from the boiler to the engine, shall pass through it. It consists of an elliptical vessel cast in two halves, the flanges of which are bolted together. The ingress and egress of the steam takes place through two flanged lateral branches, which are cast to the opposite sides of the upper half of the vessel. The ingress branch opens into a space which surrounds an open dome in the interior of the vessel, out of which dome the egress branch conveys the steam towards the engine. A hollow spherical copper float, to the bottom of which a valve is attached, is disposed in the lower half of the vessel, so as to be able to move up and down and, as the water therein accumulates by lifting the valve, cause its discharge into a pipe below. The steam on entering the vessel plays over the exterior of the dome, which has the effect of separating from the steam all watery particles; these fall to the bottom of the vessel, and the dried steam passes into the dome, and thence through the egress pipe to the engine.

[*Printed*, 10*d*. Drawing.]

A.D. 1866, May 9.—N° 1327.

JONES, John Allcock.—This invention relates to "the manu-
" facture of non-conducting substances for impeding the passage
" of heat." For this purpose " peat, turf, bog, or other similar
" accumulations of vegetable matter found in various situations,
" more particularly the peat found in the neighbourhood of the
" Tees, where it exists under the top clay, such substances being
" used either alone or in conjunction with other substances in
" the manufacture of a non-conducting medium to be used for
" the purpose of wholly or partially impeding the passage of
" caloric or heat, and as a covering for steam and water pipes,
" boilers, heaters, and for other like purposes."

The following proportions of ingredients have been found to yield a good result. 100 lbs. of peat, turf, bog, silt, or of a mixture of them, 20 lbs. of Roman or Portland cement, 15 lbs. of oxide of iron, 10 lbs. of lime, 10 lbs. of sand, 4 lbs. of cow hair, 2 lbs. of gypsum, and 4 lbs. of mineral oil. The first-named ingredients will answer either alone or mixed with more or less of the others, of which some may be omitted. One or more coatings of the composition may, when well mixed, and used in a plastic state, be applied by means of a trowel, in conjunction with wood or otherwise, to steam boilers, steam and water pipes, heating vessels, and to other purposes where it is desired to prevent either the radiation or admission of heat. Hay bands may be used to lap round the pipes and articles, saturated or plastered over with the compound, which can be rendered more secure by an outside covering of wire netting and a final coating of tar or paint. The composition moulded and dried in the form of bricks or blocks may be used for various purposes, such as covering boilers, pipes, and heaters.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 9.—N° 1333.

NEWTON, William Edward.—(*A communication from Francis Marion Roots and Philander Highley Roots.*)—This invention relates to a duplex rotating apparatus, which, when acted upon by steam or water, constitutes a rotary steam or water engine, and when driven, it will act as a blower or pump. It consists of a flat casing internally formed with hemispherical ends united by parallel sides. Through the centres from which the half circles of the ends are struck, the ends of two parallel shafts project into the casing, and fixed thereon respectively are two cross heads or abutments, which by means of toothed wheels of corresponding size fixed on the outer ends of the shafts, are made to revolve at a corresponding speed. The ends of the cross heads are made circular and the sides hollow, so that as they revolve, the circular ends of one in succession fit into the hollow sides of the other, and vice versâ. The ends of the cross head abutments as they come round, friction against the hemispherical ends of the case, each pressing alternately against the sides of the other. Wooden lugs or staves are fixed round the cross heads, for the facility of shaping them to the required form for working in contact together. Their upper and under sides work in air-tight frictional contact between the back and front of the case. The admission port opens at one side of the case, and the emission port at the other.

[Printed, 10*d*. Drawing.]

A.D. 1866, May 10.—N° 1342.

WHITE, John.—This invention relates to apparatus for manufacturing hair felt in sheets, suitable for covering steam boilers, steam pipes, and other surfaces, and thereby prevent the radiation of heat, the object being to change what previously had been performed by manual labor, into a mechanical operation, and by means of the apparatus produce sheets of felt, the sides of which are of a uniform thickness and the edges square. The apparatus consists of an open shallow rectangular box, corresponding in size with the desired length and breadth of the felted sheet. This box is horizontally divided by a perforated plate, whereby a shallow steam chamber is formed at the bottom. The hair to be felted is spread upon the upper surface of the perforated plate, so as to come beneath the rough under surface of a hollow felting block, which when lowered rests upon the hair. This block fits between the sides of the box, but is somewhat shorter in order to allow of a to-and-fro longitudinal movement, which is imparted to it from a rocking shaft, by means of a connecting rod fixed to one end of the block. The to and fro movement of the block, *aided by* the steam which rises up through the perforations of *of the plate,* causes the hair to felt together, the sides of the sheet being kept true and even by the sides of the box, and the exact fitting between them of the felting block.

[Printed, 8d. Drawing.]

A.D. 1866, May 11.—N° 1354.

WIMPENNY, THOMAS.—(*Provisional protection only.*)—This invention relates to the furnaces of steam boilers, wherein hollow fire-bars are used, and though which currents of cold water are caused to flow, in order that the bars may be kept at a low temperature, and the soldering of clinkers thereon, and consequent filling up of the interstices between the bars prevented. The ends of the bars communicate with transverse water chambers, which serve for the dead plate in front, and a support for the bars at the back, by being secured to the bridge. Into the front chamber, cold water by means of the feed pump, is being constantly forced to suit the requirements of the boiler, each fire-bar forming a separate channel leading into the back transverse chamber, which communicates with the water space of the boiler.

[Printed, 4d. No Drawings.]

A.D. 1866, May 14.—N° 1369. (* *)

POPE, ROBERT BAND.—(*Provisional protection only.*)—" Im-
" provements in governing apparatus applicable for regulating
" the speed of all kinds of machinery, the motive force acting on
" which can be altered by adjusting a valve or sluice."

The improved apparatus comprises a screw, fan, or pump, employed to propel water into an enclosed chamber. This is driven by the engine whereof the speed is to be regulated. A piston fits loosely into this chamber, and the fluid presses against it, finding an outlet through openings in the side, which are controlled by pieces attached to the piston. The piston is connected with the throttle valve. If the speed increases above the proper rate the plunger is moved by the increased pressure of the water and at the same time its covering piece partly closes the egress openings; this causes the fluid to exert still more pressure on the plunger and to thereby increase its movement and its action on the throttle valve or sluice. When the speed of the engine decreases the reverse action takes place.

[*Printed, 4d. No Drawings.*]

A.D. 1866, May 14.—N° 1375.

HOLT, THOMAS.—This invention relates to giving to steam boilers a considerable increase of heating surface, and a proportionate increase of evaporative power within limited dimensions. These objects are effected by the mode in which the flues and furnaces are constructed, which consists in the formation of a series of transverse crescent formed cells or chambers, by the use of crescent formed convex or flat plates transversely placed at close intervals in succession through the furnace or flues or both. These plates are united by flanges, which are formed round them externally and internally, whereby they are rivetted together. Air is supplied to the chambers by means of pipes, which curve round the chambers, the working water level being above their upper edge or surface, or for the purpose of drying the steam and superheating the steam, they in some boilers are constructed to rise above the water level. Various arrangements are shown and described, including vertical boilers, to some of which increased heating surface is given in the formation of the flues, by uniting in the same manner a series of annular plates, so as to keep central the draught passage, which contains a series of deflectors for the purpose of directing the flaming gases and products of combustion successively into the chambers. Other vertical boilers contain flues, formed by so arranging the plates, as to give to the flue (in transverse section) the form of a star, between the radial points of which, intermediate vertical heating chambers are disposed, which open through the stream space into small tubes in connection with the chimney flue.

[Printed, 2*s.* 4*d.* Drawings.]

A.D. 1866, May 15.—N° 1379.

HASELTINE, GEORGE.—(*A communication from David Shive.*) —The nature of this invention "consists in swinging the balls of " a centrifugal governor at an angle to a radial line harmonizing " with and corresponding to the motion of the said balls in such a " manner that the inertia, the momentum, and the centrifugal " force all act in favor of the governor instead of against it, as in " ordinary centrifugal governors." A circle, the size of the balls, is struck from the centre of the governor spindle, and two lines parallel with each other are drawn at opposite sides through the circumference; these lines indicate the position of the centres of two horizontal sockets, which are attached to a cross head fixed on the upper end of the governor spindle. Projecting laterally at the point of suspension from each of the pendulous arms of the balls, there is a fixed pin, which fits into the sockets of the cross head; these pins form the points of suspension, and are free to turn in their respective sockets, so as to admit of the movement of the balls, which in relation to the spindle, cannot be termed centrifugal, because the balls depend from the ends of the two sockets, and move in a direction at right angles therewith, and parallel in relation to each other, on lines respectively one half the diameter of the circle apart from the centre on opposite sides of the spindle, and have liberty either to fall to the rear of the points of suspension, or to swing in advance, according as the force of their inertia, or of their momentum predominates. A rod connected with the throttle valve or part to be governed, passes up through the governor spindle and carries a fixed cap, which is acted upon, as the balls rise and fall, by short arms fixed on the opposite ends of the pins from which the pendulous arms depend.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1866, May 15.—N° 1385.

NICHOL, Bryce Grey.—(*Provisional protection only.*)—This invention relates to "the construction of rotary engines to be " worked by steam or other motive power." Proposes to mount on suitable framing, a narrow cylinder, through the centre of which, supported on bearings outside, a horizontal driving shaft is fitted to revolve. Within this cylinder another cylinder is fixed upon the shaft of such smaller dimensions as to leave an annular space between them, and around this space, fixed upon the periphery of the small cylinder, a piston, composed of metallic pieces and packing tightened together by screws, is fitted to slide. On each side, diverging from the circumference of the large cylinder, there is a deep recess, into which respectively is fitted, a sliding steam resistant plate. These plates each revolution of the piston are alternately, by means of suitable mechanism, projected across the annular space, and withdrawn in time to open a free passage for the piston, the steam by means of suitable valves, being admitted into the annular space immediately afterwards, and the corresponding sliding plate simultaneously projected across it, forms the necessary fixed resistance to the steam in one direction, which drives the piston and shaft round the opposite way. Suitable ports are arranged to open out of the annular space on each side of the recesses which contain the resistant plates, and according to the required direction of motion, by means of ordinary gear, the incoming steam is directed through the corresponding ports, whilst the other ports serve for the exhaust.

[Printed, 4d. No Drawings.]

A.D. 1866, May 16.—N° 1395.

CLARK, William.—(*A communication from Frédéric Marie Piret and Eugène Michel.*)—This invention relates to the construction of furnaces, and feeding apparatus, conducive to the consumption of smoke. It consists of a narrow frame, about twice the length of the range of furnace bars, which are divided into two fixed sections, ranged respectively at the sides of the furnace, and one central movable section carried by the inner end of the frame, which is fitted to slide to and forth in the ash-pit. The fore half of the frame constitutes a narrow rectangular open box, the bottom of which, by means of suitable levers, is capable of being raised level with the upper surface of the central section of the fire-bars, which is fitted on the inner end of the frame, and which, when the latter is in position, fills the central space in the furnace. Fuel sufficient for a charge is filled into the box, which then projects from the front of the ash-pit. When the fire requires replenishing, the frame by means of a lever is forced to slide inwards, so as to shift the inner end of the frame, which carries the central section of the fire-bars, into a recess under the furnace bridge, and force the fuel box under the burning fuel between the two side sections of the grate-bars. The bottom of the box being then raised to the level of the plane of the bars, the fuel is thereby raised into the furnace, and after a short time by the withdrawal of the frame, the central section of the bars is again brought back into position under the fresh charge of fuel, and the empty box projected in front to receive the next charge.

[Printed, 1s. 6d. Drawings.]

A.D. 1866, May 17.—N° 1398.

HAMPTON, Josiah.—The object of this invention relating to *furnaces, is to* obtain perfect combustion of fuel, for which purpose, according to the first part, as applied to a steam boiler, the fire-bars are so arranged, that their collective upper surface forms the convex arc of a circle, whereby the superficial fire-bar surface is increased, and greater facility afforded for the admission of air. The second part relates to the employment of "a perforated " moveable bridge plate inclined from or towards the front of the " furnace or from or towards that part where such furnace is fed. " This perforated bridge plate when employed in combination " with the ordinary back bridge plate heretofore used will form a " chamber for the admission of air, the air being admitted to this " chamber by means of a door or valve capable of being closed or " opened when the furnace door is closed or opened; this said " door or valve which admits air to the said chamber as aforesaid " is opened and closed by means of an adjustable connecting rod " attached to the said door or valve, and attached also to an " adjustable rack and swivel or equivalent contrivance;" this rack and swivel is attached to or connected with the door of the furnace, by which means the admission of air through the perforated plate is regulated and perfect combustion obtained. Modified arrangements to suit other kinds of furnaces are described and illustrated.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, May 17.—N° 1402.

BEALE, John.—This invention relates to a rotary engine, capable, when actuated by steam or fluid pressure, of yielding motive power, and when driven by other power, of acting as a pump. The engine comprises "an outer casing or cylinder, furnished " with an inlet and outlet as usual. Within this outer casing is " fitted a revolving drum, the axle of which passes through a " stuffing box, at each end or at one end only, and is carried on " antifriction rollers or otherwise. This revolving drum is " mounted so as to be excentric in relation to the outer casing or " cylinder, and is slotted to allow two pistons or partitions (connected so as to act as one) to slide in the drum in such a " manner that the outer ends of the pistons or partitions may be " always kept in contact with the interior of the stationary casing " or cylinder. One of the pistons or partitions is larger than the " other, the smaller piston being inserted in a slot formed at one " end of the larger piston. By this connection of the two pistons " respectively the smaller becomes an elongation of the larger.

" and they together constitute one piston or partition extending
" across the whole interior of the stationary case or cylinder. The
" larger piston is connected at one end by means of pins with
" rings capable of revolving in annular grooves formed in the end
" plates of the stationary case or cylinder, and the smaller piston
" (at the reverse end of the larger) is similarly connected with
" guide blocks, which work within curvilinear grooves or slots in
" the said rings."

When the axle and drum revolve, the latter carries round the sliding pistons, which move to-and-fro diametrally in the drum, their ends or outer edges being kept in constant sliding contact and steam-tight against the internal surface of the cylindrical case, the larger piston being actuated radially by the pins which fit into eyes in the rings, and the smaller piston by the segmental sliding guide blocks, which work in the segmental grooves sunk respectively in the inner face of the rings.

The frictional parts are suitably packed and ordinary slide valves are fitted for admitting steam and reversing motion.

[Printed, 10*d.* Drawing.]

A.D. 1866, May 17.—N° 1406.

VANDIRBYL, PHILIP.—(*A communication from John Turnbull.*) —(*Provisional protection only.*)—This invention relates to condensing the exhaust steam from an engine or elsewhere, the apparatus for which "consists of an external double vessel, which
" is made most conveniently of a cylindrical form; cold water is
" caused to circulate freely through the double sides of this vessel.
" Within the external vessel is an internal vessel, also made
" double, and through which cold water is also caused to flow.
" By these means the inner surface of the exterior vessel and the
" outer surface of the interior vessel are kept constantly cold.
" The top and bottom of the exterior vessel are closed air and
" steam tight, and there are proper supply and overflow pipes to
" the water spaces above mentioned. The exhaust steam from a
" steam engine or otherwise is conveyed through a hollow axis,
" which passes through a stuffing box formed in the top cover of
" the exterior vessel. The hollow axis is arranged to have a slow
" rotating motion communicated to it when the steam engine is
" at work. On the lower part of the hollow axis is formed a
" *hollow case* which in form corresponds with but is less than the

" space enclosed by the outer and interior vessels. The hollow
" case which is carried by and revolves with the hollow axis is
" perforated with numerous small holes through which the steam
" rushes and is thereby divided into small jets which come against
" the cold surfaces, and the steam is thus very quickly condensed.
" The rotating case after being perforated is coated inside and out
" with tin."

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 18.—Nº 1408.

LYTTLE, William Alexander.—This invention, relating to steam boilers or generators, is supplementary to a prior invention, for which Letters Patent, bearing date July 10, 1865, No. 1820, were granted to this patentee. The principle of construction is such, that by means of the arrangement of the flues, power is obtained at any time (by the aid of valves or dampers) of changing the direction of the draughts, and so regulating the openings to the furnace and ash-pit, as at times to be able to exclude the atmosphere and bring into operation a centrifugal blowing apparatus; the combustion of the fuel may at any time be effected and supported, either by air supplied under pressure heated or otherwise, or by the ordinary arrangement of an open ash-pit, and a free draught of the atmosphere. With the exception, that the waste gases of combustion are not allowed to enter and mingle with the steam in the boiler, all the arrangements described in the former Specification may be adopted, any kind of fuel, either solid or liquid may be used, and either of two chimneys, respectively, adapted to the two systems of combustion, may be brought into requisition.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 18.—Nº 1410.

BERNARD, Julian.—This invention, relating to apparatus for "generating and heating steam, gas, and vapours," consists, according to one modification, in the use of a vertical cylindrical vessel or generator, containing a series of vertical concentric cylindrical partitions, which are formed into two series of deep annular chambers or cells, by alternately closing the upper and lower ends, so that every other annular space forms a generating cell, which opens to the steam space at the top of the generator, and the intervening concentric spaces form heating cells communicating with the hot air space which occupies the bottom of the apparatus. Within the upper end of each generating cell, there is fixed an annular water trough, the bottom of which is perforated, and depending from each of the troughs, reaching towards the lower ends of the generating cells, there is a thick annular webbing of felt or of other material capable of absorbing water, which is supplied to the annular troughs in regulated quantity through small tubes arranged to the proper level; thence the water constantly percolates through the perforations in the bottom of the troughs, is absorbed by the suspended webbing, and gradually draining down between the heating cells, is converted into steam. The heated air is forced into the hot air chamber and annular heating cells from an adjacent furnace, and the steam is carried off to its use through suitable pipes. Another modification is described and illustrated.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, May 21.—N° 1432.

BLACKBURN, Alexander Bewicke.—(*Provisional protection only.*)—This invention relates to the preparation of lubricating compounds. The inventor states that the proportions of materials herein given "may be varied, but I prefer to mix sixteen " pounds of glycerine with a solution formed of one pound of " starch or mucilage, such as is obtained from linseed and other " vegetable substances dissolved in water so as to produce about " the same degree of vicidity as the glycerine. To this mixture " are added twenty-four pounds of good lubricating oil (castor " oil being preferred) and also a quantity of soft soap, equal to " two per cent. of the whole mixture; these ingredients are then " agitated together till a finely divided emulsion is formed. In " supplying lubricating fluids to a journal or bearings of " machinery a small hole is made in the bottom of the " lubricating vessel, into which hole a pin is inserted fitting the " hole loosely and having a spherical and heavy head which " covers the hole. When used in marine engines, or railway " carriages, or other moving machinery, the motion causes the " spherical-headed loose pin to oscillate freely in the hole, and " every oscillation partly uncovers the hole and allows the " *lubricator to* pass through it and flow down to the journal or

" bearing beneath. When in a state of rest no flow takes " place."

[Printed, 4*d.* No Drawings.]

A.D. 1866, May 21.—N° 1433.

CRICHTON, Alexander.—This invention relates to apparatus for condensing the steam from marine engines, whereby the use of an ordinary surface or other condenser, and of the circulating pump are dispensed with. The eduction pipe from each cylinder conducts the steam into a feed water heating vessel, where a portion of the heat contained in the steam is imparted to the water as it passes on to the boiler; thence the steam is conveyed by suitable pipes through the skin of the vessel into metallic tubes disposed outside low down beneath the surface exposed to the cold sea water. These tubes are attached outside to the vessel, extend horizontally under the quarter towards the stern post, and return along the other side, or communicate aft with tubes which convey the water of condensation inboard to a conduit at the foot of the air pumps, or to other convenient place for collecting the fresh water, and utilizing the vacuum produced by the condensation of the steam. Suitable arrangements are made, that in the event of the external tubes being injured by accident or otherwise, an ordinary condenser and circulating pump can be brought into operation.

[Printed, 8*d.* Drawing.]

A.D. 1866, May 22.—N° 1441.

NEWTON, Alfred Vincent.—(*A communication from Matthias Wharton Baldwin.*)—" This invention relates to improvements in " details for preventing the escape of steam past the piston of " rotary engines. The cylinder is bored true on the inside as " usual, and fitted with heads between which are the steam ports " leading into the cylinder from a reversing valve of any suitable " construction for the induction and eduction of steam. Between " the ports an adjustable packing piece is placed extending the " length of the cylinder between the heads. Mounted excentri- " cally in the cylinder heads is a shaft, the periphery of which " touches the cylinder at the part where the packing piece is " inserted, so as to prevent the passage of steam at that point.

" To prevent steam from leaking at the journals of the cylinder " heads packing rings are let into a recess in the shaft and heads. " These rings are kept in contact with the outer shoulder of the " recess in the journal of the shaft by the presence of steam " acting within the cylinder. The excentric shaft is fitted with a " slider or piston of the length of the cylinder, and fitted steam-" tight though sufficiently loose to work freely back and forth in " its place. The ends of this piston are provided with moveable " packing pieces. At its outer edge it carries a hinged vibrating " segment of the length of the cylinder, and of sufficient width " to cover both the inlet and outlet ports. The hinged joint on " which the segment moves enables it throughout its revolution " to adjust itself to the bore of the cylinder. The shaft is " recessed to admit of the segment sinking within its periphery " in passing the cylinder packing. The piston and its end " packing pieces are driven out and kept in contact with the " cylinder and heads by means of steam admitted to a cavity " behind the piston, and to the packing through ports pro-" vided for the purpose, the steam being taken directly from " the boiler and independent of that used in the cylinder."

[Printed, 8*d*. Drawing.]

A.D. 1866, May 23.—N° 1451.

DOUGLAS, SHOLTO. — This " invention has for its essential " object a certain peculiar arrangement of machinery or apparatus " to be actuated by steam, water, compressed air, or other liquids " or gases. . . . A wheel or wheels is or are carried on an " axle or axles which rotate in water, air, or steam-tight bearings " fixed in the sides of a cylinder or case. The case is so con-" structed that the wheel revolves freely within it and in such " manner that as little wear as possible may result from the " movement of the wheel therein. On the circumference or in " the body of the wheel several curved passages are made; these " passages are so formed that the water, steam, compressed air, " or gas entering therein leaves the passages by escaping there-" from to the same direction or approaching to the same point " on the wheel that is entered, that is to say, the passages are " bent into a curved figure, and by the resistance opposed to the " *passage* of the water, steam, compressed air, or gas as it issues

" from the return end of the passages additional power is obtained " over and above what would be due to the pressure of the " column of water, steam, compressed air, or other fluid under " ordinary circumstances." The number of the passages may be varied.

[Printed, 1s. 4*d*. Drawings.]

A.D. 1866, May 24.—N° 1457.

GREEN, THOMAS.—This invention relates to a steam boiler of the vertical class. The shell is cylindrical, it stands a considerable height, and is covered in with a convex top. The base of the fire-box is nearly as large in diameter as the base of the shell, to which it is rivetted, a metal ring being interposed between them. The fire-box is conical, tapering upwards from the base where the fire-bars are ranged, to about the level of the water line, where the opening into the uptake, for the purpose of confining the heat as much as possible in the furnace, is contracted to a small area, thence expanding upwards through the steam space towards the chimney, which is centrally mounted on the top of the boiler. A number of large water tubes are transversely disposed above each other at different angles in the furnace, so as to form water communications from side to side, and also serve as stays. The ash-pit is formed in the cast-iron bed plate upon which the boiler is mounted, and which may be made hollow for the purpose of heating the feed water. The invention includes a hot water boiler, constructed internally on the same principle, for heating and warming purposes.

[Printed, 1s. 4*d*. Drawings.]

A.D. 1866, May 25.—N° 1461. (* *)

VOSS, WILHELM HEINRICH CHRISTIAN.—(*Provisional protection only.*) — " Improvements in rotary steam and hydraulic " engines."

This invention relates to an arrangement of rotary engines worked either by steam or by water power, in which the rotary motion of the spindle or shaft is effected by the action of a series of reciprocating pistons and piston rods upon an inclined plane disc to which the said spindle or shaft is connected, such action of the pistons and piston rods producing a rotary motion of the inclined plane disc round a central axis.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 25.—N° 1462.

GIBSON, William, and ELLIS, Edward.—This invention relates to apparatus for making metal rods, bars, and tubes, direct from the bloom or ingot, without subjecting the metal to the usual intermediate processes, and it also relates in connection with and during the process, to the development of a steam power which is advantageously availed of. The invention consists in forcing in a heated state ingots of iron, steel, or other metal through the narrow end of a cylindrical or coniformed chamber, containing the die or dies, which fit therein. The chamber is strengthened by a series of collars and placed within an outer casing or chamber in form corresponding with the inner, but so much larger as to leave between them an interspace for holding water, which prevents the heating to a red heat of the inner cylinder and die. Water is also applied internally to the ram for the same purpose. The bloom or ingot of metal is forced through the die at the small end of the cylinder by an hydraulic ram, which enters at the upper end, and after having at the beginning of the operation forced the mass of hot metal into the cylinder, is slightly released, and a few drops of water are through a valve in the end of the ram forced upon the metal. From this small supply of water steam is immediately generated, by the expansive pressure of which aided by the pressure of the hydraulic ram, the metal is forced through the die, more drops of water being forced into the chamber as the process proceeds and the metal is exhausted therefrom. The two pipes, which respectively convey water to the interspace between the cylinders, and carry off the steam generated there, may be connected to a steam boiler.

[Printed, 8*d.* Drawing.]

A.D. 1866, May 28.—No. 1487.

DAVIES, George.—(*A communication from Emmett Quinn.*)—This invention of apparatus for supplying steam boilers with feed water consists of a box or casing comprising three separate chambers. Two of these are placed one upon the other, so as to communicate through a neck, the passage in which is governed by a throttle valve. In the side of the lower chamber there are two openings; the upper one, which communicates through a pipe with the steam space of the boiler, and is carried down therein to the working water level, is furnished with a circular valve, and the lower opening with a flap valve, which opens outwards at bottom into a side chamber, whence, by means of a pipe, there is a communication with the lower water space of the boiler. The throttle valve and the circular valve are kept in constant motion by the machinery, alternately opening and closing the passages they govern, so that when the water in the lower chamber is discharged into the boiler, the chamber is refilled from the top chamber by the next opening of the throttle valve, and there is no discharge, although the two valves keep working and opening until the level of the water in the boiler sinks below the end of the steam pipe; when this occurs the steam rushes up the pipe to the circular valve, and through it upon the water in the bottom chamber when the passage is next open, the pressure of the steam upon the water then forcing back the flap valve, the water gains admission to the side chamber, and thence flows down the pipe into the boiler. The next closing of the circular valve is followed by the opening of the throttle valve, and the refilling of the lower chamber, when if the water level is still below the steam pipe, a second discharge of water takes place, and is repeated until the proper level of the water is re-established. Modifications are described and illustrated.

[Printed, 10*d*. Drawing.]

A.D. 1866, May 29.—N° 1495.

HASELTINE, George.—(*A communication from Jacob James Lavo and Peter Menard Chouteau.*)—(*Provisional protection only.*) This invention of a composition for removing and preventing incrustation in steam boilers consists of 5 lbs. of barium, 1 lb. of sal ammoniac, 4 lbs. of rectified sugar, and 4 lbs. of concentrated lye. The ingredients are to be well mixed together, and into a reservoir containing 54 barrels of feed water, 1 lb. of the composition should be introduced every 24 hours. Care must be taken to exclude the air from the vessel containing the compound, as when mixed it is exceedingly volatile.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 30.—No. 1511.

CAITHNESS, James Earl of.—(*Provisional protection only.*) This invention relates to a mode of cleaning the external surfaces of boiler tubes by means of a loose perforated plate. The perforations in this plate correspond with the holes in the tube plates between which it is placed, the tubes easily sliding through it; when not in use it rests against one of the tube plates. When the tubes require cleaning the plate is moved from its position, and drawn along the tubes towards the opposite tube plate, scraping and cleaning as it passes along such of the tubes as are in a foul state. "In the case of boilers containing a greater "number of tubes than can be conveniently cleaned by one plate "or scraper, it is proposed to employ two or more such plates, "according to the number of tubes in the boiler, each plate "cleaning or scraping its own group or set of tubes."

[Printed, 4*d.* No Drawings.]

A.D. 1866, June 1.—N° 1530.

YULE, John.—This invention relates to steam engines, the cylinders of which are provided with separate valves, actuated by different excentrics, respectively for the induction and the eduction of the steam, so that the working of the induction valve can be regulated to cut-off at any part of the stroke without interfering with the working of the exhaust. Two piston valve spindles on the plane of the axis of the cylinder of a horizontal engine are disposed parallel therewith in tubular passages formed on opposite sides of the cylinder. The ends of these passages are bored out to receive bushes, wherein, fixed upon each spindle, are two piston valves, which govern the induction and eduction ports leading respectively from between the valves out of the tubular passages, the ends of which are closed by suitable packings. "The details are obviously susceptible of modification, "and are equally applicable with ordinary two-cylinder engines "for land or marine purposes, and with double cylinder expansion "engines. In the last-mentioned case there will be three passages with their pistons to each pair of cylinders, one between "the cylinders, and one at each outer side. The improvements "are also applicable to vertical or inclined engines."

[Printed, 10*d.* Drawing.]

A.D. 1866, June 1.—N° 1534.

BURROWS, William, and BURROWS, Joshua.—(*Provisional protection only.*)—This invention relates to the constructive arrangements of locomotive engines for common roads. A vertical boiler with horizontal engine attached is employed. By means of spur gearing, the engine gives motion to the shaft of a fly wheel which acts as a brake wheel. The stopping, starting, and steering motions are arranged convenient to the hand of the driver. The latter motion is effected beneath the body of the carriage by means of a chain wheel upon the steering axle, and an endless chain, which passes thence round a chain wheel upon the lower end of the steering spindle, which is carried up to its position near the driver. There are, within the body of the carriage, two seats for passengers supported by spiral springs. Beneath one seat there is a water tank, into which the exhaust steam is blown through wire gauze upon the surface of the water, and formed under the other seat is a box for fuel. The tires of the wheels are made of rolled T iron, and the spokes of bar iron, with cast-iron naves. The boiler contains a conical fire-box, with water tubes so arranged as to form a spiral passage for the fire draught, wherein the combustion of the smoke takes place. It is stated that neither fire nor smoke is seen, and that the working of the engine makes no objectionable noise.

[Printed, 4*d*. No Drawings.]

A.D. 1866, June 2.—N° 1535.

TURTON, Samuel.—This invention relates to apparatus for feeding and cleansing steam boilers, which consists of a tube perforated along its upper surface, whereon is formed a series of short troughs. This tube extends the whole length of the boiler, is closed at one end, and (as shown by the drawing), is fixed along the inside of the boiler about the water level. The free end of the tube communicates with a three way cock outside the end of the boiler, by which means, when the cock handle is turned in one direction, the feed water is admitted to the tube, and passes thence through the perforations up into the series of troughs, and overflows, at the same time that the scum and sedimentary matter, which is brought to the surface by the boiling water, sinks into the troughs and through the perforations into the tube, and thence is ejected by the steam pressure, when the handle of the cock is turned so as to open a communication with the discharge pipe, the feed water supply being simultaneously shut off.

[Printed, 8d. Drawing.]

A.D. 1866, June 2.—N° 1539. (* *)

BROWN, Andrew Betts.—"Improvements in engines for " pumping water, applicable to engines for feeding steam " boilers."

"I employ a steam cylinder containing a piston with a piston " rod of large diameter on one side of it and terminating in the " ram of the pump. The steam is admitted to the further side " of the piston by means of a slide valve working in a casing " beyond the end of the cylinder, the valve face being on a plane " at right angles to the direction of motion of the piston. The " valve has horns formed on it, between which a crank pin or " small eccentric is lodged, and the said pin or eccentric is carried " by a light shaft passing out of the valve case through a " stuffing box and journal, and having a small fly wheel upon it " which takes its motion by means of a connecting rod passing " from a crank pin in the face of the wheel to an arm which " projects from the piston rod or ram between the steam cylinder " and the barrel of the pump, or the arm and connecting rod " may be made together in one piece. Double-acting pumps " may be worked in a similar manner, the areas of the two " sides of the steam cylinder being in this case made more " nearly equal."

[Printed, 8*d*. Drawing.]

A.D. 1866, June 8.—N° 1576.

FRASER, William John.—(*Provisional protection only.*)—This invention relates to vertical boilers with internal fire-boxes, which are surrounded and covered with water space, and contain a number of water tubes, so arranged at one part of their length, as to form the fire-grate surface similar to an ordinary range of furnace bars. The upper and lower ends of the water tubes, communicate respectively with the water space surrounding the upper and lower parts of the fire-box, beneath which is a combustion chamber, whereinto the burning products of combustion, with downward draught descend, and thence either rise up through vertical flue tubes disposed in the surrounding water space, or are distributed round the outside of the boiler within an external flue enclosed by brickwork. Those parts of the *water tubes* which form the fire-grate surface within the fire-box, are somewhat flattened in order to admit of their being more closely arranged.

[Printed, 4*d*. No Drawings.]

A.D. 1866, June 9.—N° 1584.

INGRAM, JENKIN JONES, and PHILLIPS, GEORGE RICHARD.—(*Provisional protection only.*)—This invention relates especially to valves for the feed pumps of steam engines, and it is applicable to purposes in which regulating valves and cocks are used.

It "consists in the use of a valve composed of a disc of india-
" rubber, leather, or other suitable elastic material fixed in the
" centre to a seat formed in the aperture leading from the suc-
" tion pipe, such disc of elastic material being combined with a
" moveable guard or stop for regulating the extent to which the
" valve is capable of opening for the passage of water or other
" fluid from the suction pipe. The seat for the valve is or may
" be formed by a bar across the aperture with a boss in the centre
" of the bar to receive the screw stud or pin by means of which
" the disk is to be fixed to the seat. The disc when fixed in the
" seat has its outer part or edge resting on a part of the valve
" box in which the passages for water or other fluid are cast or
" otherwise formed."

[Printed, 4*d*. No Drawings.]

A.D. 1866, June 11.—N° 1589.

THORNTON, ALBERT.—This invention relates to apparatus for heating feed water for steam boilers, and for maintaining in boilers a free circulation of the water. For this purpose the feed water, driven by a pump or other means, before entering the boiler, is forced to flow a circuitous course through a continuous channel in a bended pipe, which passes through the ash-pit under the firebars into the flue beyond, where it is formed into several coils, and thence returns through the other side of the ash-pit to the front, where it is attached and opens to the boiler. During its passage through the pipe, the temperature of the water is gradually raised, so that it is discharged into the boiler in a heated state. When the feed is shut off from the pump, by means of valves or cocks, the ends of the heating pipe are made to form a communication respectively between the upper and lower parts of the boiler, and the heat of the flues, by causing an upward flow of water into the pipe, sets the water within the boiler in circulation.

[Printed, 8*d*. Drawing.]

A.D. 1866, June 11.—N° 1591.

SEWARD, JAMES—(*Provisional protection only.*)—This invention relates to apparatus for the prevention of "priming" in steam boilers, for the discharge of the water of condensation from steam pipes, and for regulating therein the steam pressure. The anti-priming apparatus consists of a box, divided by two or more partitions and interposed in the steam passage between the boiler and the engine. As the steam enters the box it impinges against the first partition, and then passes under it and over the second partition, whereby the watery particles are separated from the steam, and falling through a perforated plate at the bottom of the box, are discharged through an outflow tap or valve. The apparatus for dischaging the water of condensed steam "consists of a " hollow valve spindle and taper plug; an aperture in the upper " end of the hollow spindle admits the flow of condensed steam " or water (by the pressure of the steam in the box above-men- " tioned) to a hollow fulcrum supporting and communicating " with a hollow lever, which lever is divided by an internal lon- " gitudinal midfeather, forming in such lever two passages, the " lower one being a 'water way,' the upper one a steam passage; " steam is admitted to the upper passage from the steam pipe of " the boiler. At one end of the lever is a hollow sphere or globe " communicating with the water way and steam passage of the " lever; at the other end of the said lever is a counterbalance " weight. When the condensed steam or water ascends the hollow " spindle of the valve along the interior of the lever to the hollow " sphere or globe in quantity sufficient to overcome the counter- " balance weight on the other end of the lever, the said lever is " depressed by the weight of condensed steam or water in such " hollow sphere or globe, raising the hollow valve spindle, and " the condensed steam or water is discharged at an outlet pipe." The apparatus for regulating the pressure of steam in pipes "con- " sists in the use of a hollow lever, the fulcrum on which such " lever works is also hollow, and serves to admit steam to the " interior of one end of such lever; attached to the end of the " *said lever* is a pipe communicating with the steam passage

" and with a vessel containing mercury, from the bottom of " which vessel is a second pipe and valve communicating with " the passage in the lever (the point of communication being " beyond the hollow fulcrum) and with a hollow sphere or globe " placed on the end of such lever for the reception of mercury."

[Printed, 4*d*. No Drawings.]

A.D. 1866, June 12.—N° 1593. (* *)

LEES, Samuel.—" Improvements in furnaces for consuming " petroleum and other hydrocarbons." They consist in constructing the furnace of a metal trough lined with fire-bricks and filled with metal balls. This trough occupies the space of the usual grate bars. Air is supplied through perforations in the door, which may have fitted to it a handle with notches to keep it open when required. A baffle plate is placed near the door and above the trough to guide the air into the trough. The hydrocarbon is supplied by a pipe from a cistern to the front end of the trough. Before starting all the balls are taken out; the hydrocarbon is then run in, and the small balls, which may either be solid or with a hole in the centre forming the first layer, after being heated, are placed in the trough. The hydrocarbon is thus ignited, and then hollow perforated balls are placed in the trough; these latter may be put in cold. Different diameters are employed for each layer, having the largest at the top. The combustion gradually heats the balls, and the gases mixing with the air supplied through the door and contained in the hollow balls are consumed. By connecting a tap in the supply pipe to a gauge the supply of hydrocarbon can be regulated. The invention may be modified by the application of hollow perforated revolving grate bars, either in combination with or in addition to the balls. This improved furnace is shown as applied to a steam boiler, but the patentee states that it may also be used for any purpose where ordinary furnaces are now applied.

[Printed, 8*d*. Drawing.]

A.D. 1866, June 12.—N° 1594.

LEIGH, Thomas Joseph.—This invention relates to the construction of furnaces for burning all kinds of bituminous, carbonaceous, ligneous, gaseous, and other fuels, whereby the atmospheric air and the constituent elements of the fuel are brought together in such a manner that a large suface is exposed to their mutual action, and a complete mixture effected at a temperature equivalent to a white heat. This result is obtained by burning the fuel upon a bed of molten metal, through or over which the atmosphere, either alone or mixed with steam or other vapour which emits oxygen, is forced by suitable blowing apparatus. The furnace or heat generator, when applied to steam boilers, occupies the space ordinarily employed by the fire-box and ash-pit. A transverse partition filled with water depends from the roof of the furnace, reaching down towards the burning fuel, which is introduced from a hopper in regulated quantities by revolving feeders. The air is introduced into the furnace through tuyeres disposed at suitable angles for its proper distribution. The arrangements according to the particular application of the invention are considerably modified.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1866, June 13.—N° 1601.

KITTOE, GEORGE DOMINICUS.—This invention relates to steam engines which have their cranks working inclosed in steam space open to the cylinder. The first modification exhibits and describes a high-pressure engine, the cylinder of which is mounted upon a pedestal. The rod of the piston works downwards through a stuffing box in the neck of the pedestal, and carries the plunger of the feed pump, which is disposed centrally in the base, directly under the vertical axis of the cylinder. The upper side of the piston block is recessed, wherein is jointed the lower end of a short connecting rod. The upper end of this rod is coupled to the pin of the crank arm, which revolves in a chamber or casing containing just sufficient hollow space for the purpose; this chamber is formed with the top cover and is open to the interior of the cylinder. The face of the boss of the crank arm round the shaft is got up to a true annular surface, which is pressed against the corresponding surface of the chamber round the shaft entrance by the expansive force of the steam, and serves instead of a stuffing box. The steam valve, which is circular, is actuated by a pair of tooth wheels, one of which is fixed on the crank shaft, and the other on the valve spindle, which enters through the cover of the chest and fits loosely into a square hole in the back of the valve.

A flanged collar on the spindle prevents the escape of steam, being constantly kept in frictional contact with the interior of the box by the steam pressure. Other modifications are described, including condensing and also pumping engines.

[Printed, 2*s*. 6*d*. Drawings.].

A.D. 1866, June 13.—N° 1611.

PRICE, Astley Paston.—(*A communication from Jakob Bührer and Carl Hamel.*—(*Provisional protection only.*)—" This " invention relates to furnaces constructed with special combus- " tion chambers or fire-places, wherein finely divided or powdered " fuel is intended to be burnt in a manner similar to that " described in the Provisional Specifications respectively filed by " Francis Wise, on the 4th of April 1866, No. 956, and by me " on the 12th of May 1866, No. 1365, and has for its object the " ensuring a more perfect combustion of the fuel employed."

It is proposed to introduce into the combustion chamber or furnace, a number of fire-clay or metal stops or obstructors, placed at suitable distances, so as to form lodgments for the fuel. These stops may be removable, capable of revolving, and either hollow or solid. The fuel is introduced by a suitable feeding apparatus placed above, whence it is allowed to descend in regulated quantity, and gradually falls from one obstructor to another until it reaches the bottom of the furnace, the time occupied in its descent being sufficient to effect its complete combustion. The air may be introduced at the bottom of the furnace, or at the sides, and its currents so directed as to meet the descending fuel. When made of metal and hollow, the obstructors may communicate with the water spaces of the boiler, or they may form passages for heating air.

[Printed, 4*d*. No Drawings.]

A.D. 1866, June 15.—N° 1628.

STEVENS, Benjamin Franklin.—(*A communication from Simon Stevens.*)—The object of this invention, is the obtaining increased heat from the combustion of inflammable gases, by mixing steam therewith, whereby they are rendered more suitable as fuel for the generation of steam, manufacturing and domestic purposes.

The gas produced by the distillation of coal, wood, resin, petroleum, peat, or other hydrocarbon substances, is introduced through suitable pipes into the furnace, which is fitted with an arrangement of burners and appliances such as may be ordinarily used for the purpose, additional pipes being required for the admission of steam, which is caused to commingle with the gas just before the point of ignition. The effect produced is a great increase in the volume of flame, which when applied to steam boilers, entirely fills the furnace and heating tubes. Instead of mixing the gas and steam, the impulsive force of the latter may be so directed, as to induce an increase draught of air upon the flame, or when mixed, the compound may be employed to aid the combustion of ordinary solid fuel.

When the combined inflammable fluid is employed to produce a light suitable for illuminating purposes, it is effected by heating in the flame, lime, or platina sponge or wire, to a white heat.

[Printed, *4d.* No Drawings.]

A.D. 1866, June 19.—N° 1647.

BLATCH, Thomas.—The object of this invention, relating to steam engines, is to reduce the cost of construction and lessen the ordinary amount of friction, by diminishing the number of the working parts, for which purpose, an ordinary steam engine cylinder is made to revolve upon a transverse axis, and thereby produce direct rotary motion. The cylinder contains a piston, which occupies internally one-half its length; no piston rod is required. The transverse axes of the cylinder are cast thereto, and project diametrally from the sides at its mid length. One side axis is a plain shaft, and is supported in an ordinary bearing. The other side, which contains the induction and eduction passages, passes through a fixed shell, and rests in a coupled bearing. beyond. Passages separately arranged in the shell, respectively communicating with the boiler and with the atmosphere, admit the steam alternately to each end of the cylinder every revolution, and open ways for the exhaust. The cylinder covers are held to the ends of the cylinder by means of a central bolt, which passes through the piston and is secured by a nut on each end outside the covers. Springs are fixed inside each cover to check the momentum of the piston, and prevent concussion. The rotary motion is obtained by the weight of the piston, which is always kept on one side of the centre of rotation by the expansive force of the steam, which being admitted alternately into the ends of the cylinder, as they by turns come under the axis, lifts the piston to the end which is uppermost, and it is by this successive lifting of the piston from below, to the ends of the cylinder as they in rotation come above the axis, and the keeping it in that position while by its weight it by turns brings the upper ends down, that continuous rotary motion is established.

[Printed, 8*d*. Drawing.]

A.D. 1866, June 20.—N° 1658.

ABBOTT, JAMES.—This invention relates to the use of movable fire-bars and deflectors, in steam boiler and other furnaces, for the purpose of effecting the better combustion of fuel. The edges of the fire-bars are serrated and the extreme ends pivotted to rest regularly ranged in recesses formed along the upper edges of the transverse supporting bars. Fitted to slide upon brackets fixed to the sides of the ash-pit, is a transverse rail, the upper edge of which is notched at regular intervals to receive the under edge of the several fire-bars, so that when, by means of a lever or otherwise in front, a transverse sliding motion is given to the rail; an oscillating movement is thereby communicated to each fire-bar, whereby the clinkers are broken up, and the air passages kept free. A movable fire-clay deflector is fitted in the upper part of the furnace, and caused to traverse to and fro the length of the furnace by means of a coarse threaded hollow screw, from which it depends. This screw, turned from the outside, is fixed along the top of the furnace, and forms a passage for the admission of air, or air and steam, which issues from the under side of the deflector, so as to come in contact with the burning fuel. The position of the deflector, which forms a transverse movable partition in the furnace, is changed according to the state of the fire. When fresh fuel is introduced in front, the deflector is shifted towards the rear of the furnace over the incandescent fuel, so as to bring the inflammable gases and visible products of combustion to mingle with the air and steam over the hottest part of the fire. Modifications are described.

[Printed, 10*d*. Drawing.]

A.D. 1866, June 22.—N° 1666.

PARKER, JAMES.—This invention relates—

1st. To applying the elastic force of steam under pressure, or of compressed air, to vessels containing water, for the purpose, by acting direct upon the surface of the water without the aid of a piston, of raising and ejecting the water through suitable pipes in any required direction. The steam jets and air nozzles, described in the Specification of two prior Letters Patent granted to this inventor and dated respectively February 28, 1862, No. 552, and October 25, 1863, No. 2620, are preferred for the purpose.

2nd. Consists in propelling vessels by means of jets of water, which are forced out through delivery pipes, situated respectively at each side of the deadwood of the vessel contiguous to the stern post below the water line, by the pressure of steam or compressed air. For this purpose, two closed vessels or tanks are disposed in the after part of the ship below the water line. Each tank is fitted with an outlet pipe, which communicates with the water outside the vessel, and is closed by a valve opening inwards; the inner ends of the delivery pipes are connected to and open into the tanks. By means of suitable pipes, the steam or compressed air is admitted to the vessels alternately, so as to produce a continuous ejectment of the water, by turns through the delivery pipes at the stern, the internal pressure, whilst this part of the operation is going on, alternately closing the inlet valves. Instead of two delivery pipes, one to receive the alternate discharge from the tanks may be employed. The reaction of the external water on the outflowing jets, causes the vessel to go ahead.

3rd. Employing the same kind of apparatus, with some slight modifications, for pumping and raising water.

[Printed, 4*d*. No Drawings.]

A.D. 1866, June 22.—N° 1668.

DUFOUR, Charles Alphonse.—This invention relating to "metallic packing for stuffing boxes and other obturators" .... "consists in substituting a number of metal rings for the ordinary hemp packing." These rings are partly "conical, and are made either of iron, copper, or a mixture of tin, lead, and copper forming an antifriction substance. In placing them in the stuffing box care must be taken that the conical ends shall meet whilst the opposite or wide ends come in contact, that is to say, the first ring must be put into the box wide end first, *the second* ring just the reverse or small end first, so that the *two small* ends meet; the third ring again wide end first, and

" the fourth and last . . . . small end first." Thus arranged, with a wide surface at the top to receive the pressure of the gland, and another to support the pressure at the bottom, the weight is equally distributed throughout the rings, which are forced outwardly against the sides of the box, the interior surfaces adapting themselves to the shaft in such manner as effectually to prevent any escape.

[Printed, 8*d*. Drawing.]

A.D. 1866, June 22.—N° 1669.

TURTON, George.—(*Provisional protection only.*)—This invention of a rotary steam engine " consists in using two cylinders " of different diameters mounted upon the same central axis " placed one within the other, the larger cylinder being fixed and " the smaller one rotating therein, a greater or less space being " left between the outer circumference of the smaller cylinder " and the inner circumference of the larger cylinder; extending " across the space between these cylinders there is, first, a fixed " piston on the periphery of the rotating cylinder made steam- " tight, and, secondly, a moveable radial slide fitted in the side " of the fixed cylinder. The slide moves out of and into the " piston space as the latter passes it. The slide moves radially, " is made hollow, and has inlet and outlet steam passages formed " therein; it thus serves the double purpose of an abutment and " valve at the same time, while the steam is admitted and cut off " by the simple movements of the slide itself," which movements are obtained from cams fixed upon the main axis outside the ends of the large cylinder. The parts requiring to work steam-tight are packed with metallic packing, cushioned at back with vulcanized india-rubber. The steam is admitted, according to the desired direction of rotation, either to one or other side of the slide, by means of a four way cock, the turning of which either to the right or left, produces a corresponding change in the motion.

[Printed, 4*d*. No Drawings.]

A.D. 1866, June 22.—N° 1674.

NEWTON, Alfred Vincent.—(*A communication from Henry John Behrens, Henry Curtis Dart, and* Edward Dart.)—This invention relates to a rotary engine, which although designed more especially for use as a motor, to be driven by steam, water or other fluid, may, by having a proper external application of power, be employed as a pump. " The pistons attached to two parallel " shafts geared together so as to rotate in opposite directions at " the same velocity are of the form of segments of rings, con- " centric with their respective shafts, projecting from the inner " face of discs, which are keyed to those shafts. The outer " arc-formed surfaces of the pistons are fitted to and rotate " within two parallel laterally communicating bores in the same " cylinder or casing, and their inner arc-formed surfaces are fitted " to and rotate around two stationary hubs concentric with their " respective shafts and bores of the cylinder. The axes of the " shafts and their respective bores of the cylinder are situated at " such distance apart and the aforesaid fixed hubs are so recessed " in a concave arc form that the outer arc-formed face or faces of " the piston or pistons of one shaft fit the recesses in the fixed " hub which surrounds the other shaft in such manner as to pre- " vent the steam, water, or other fluid from passing between the " piston of either cylinder and the hub of the opposite one. The " induction and eduction pipes are arranged in opposite positions " where the two bores of the cylinder meet. These bores are " commenced at opposite sides of the cylinder, but do not extend " quite through the cylinder, a portion of the metal of the cylin- " der being left solid at the back of each bore for the support of " the fixed cylindrical hubs, which are concentric with their " respective bores. The cylinder is fitted with two removable " heads, which are fitted with the stuffing boxes for the two " parallel geared shafts that carry the pistons on the opposite face " of each disc to that on which the piston is arranged, and on " the opposite side of the axis thereof there is secured to the " disc a counterbalance to counterbalance the weight of the " piston, and the heads of the cylinder are recessed for the recep- " tion of these counterbalances. In the operation of the engine " as a motor the steam or other motive agent acts upon the piston " or pistons of each shaft alternately, while the piston or one of " the pistons of the other shaft serves as an abutment. When " the engine operates as a pump the vacuum is produced for the " entrance of the liquid, and the liquid expelled by the piston or " *pistons of* each shaft alternately."

[Printed, 6d. Drawing.]

A.D. 1866, June 23.—N° 1675.

DAVIES, George.—(*A communication from Emmett Quinn.*)—(*Provisional protection only.*)—This invention relates to steam gauges, and consists in constructing a tubular gauge, adapted to indicate the force of high-pressure steam, without requiring to use a column of mercury of more than the usual height. To effect this, two, three, or more vertical tubes of the ordinary length are placed in position, and the top and bottom ends respectively so alternately united by short bends, as to form one continuous passage from tube to tube through the whole number. Small cocks are fitted at top and bottom in each of the bends, to close the internal communication when necessary; each cock in the top bends also opens a vertical passage to the atmosphere. Through these several vertical passages the lower half length of each of the tubes is filled with mercury, and the upper half with water. The tube at one end of the series communicates with the steam space of the boiler, and the tube at the other end is of glass, and furnished with a graduated scale. When the cocks are turned so as to open the passage from end to end of the series, the vertical passages being closed, the instrument is ready for use.

[Printed, 4*d*. No Drawings.]

A.D. 1866, June 25.—N° 1694.

FIELD, Edward, and WISE, Francis.—This invention, relating to steam generators, consists, 1st, "in the adaptation to "cylindrical and other circular boilers or heating vessels, not "having internal flues, of water tubes projecting outwards from "the lower part of the boiler into the furnace and combustion "chamber or flue space, and in setting or placing such boilers "or vessels with their under sides in an inclined position, so "that the portion thereof which is situated immediately over the "furnace and combustion chamber or flue space containing the "water tubes as described, may form a slope or descent, which "it is recommended should not be less than one in twelve, from "the furnace to the back end of the boiler, for the purpose "causing substances contained or held in solution in the water "to descend and be accumulated at the backward or lower end, "where they may be blown off . . . . in the usual manner."

The tubes to which preference is given, are those which are furnished with either internal tubes or diaphragms, for the purpose of providing separate passages for the downward and upward current in each tube, as described in the Specifications of two Patents, dated and numbered respectively, November 1st, 1862, No. 2956, and October 16th, 1865, No. 2661. The arrangements of the furnace are modified in the 2nd and 3rd parts of the invention, and the 4th part consists in galvanizing or coating with zinc those parts of tubes which are brought into contact with the water or liquid, for the purpose of avoiding the incrustation thereon of earthy or saline particles.

[Printed, 2*s*. Drawings.]

A.D. 1866, June 26.—N° 1700.

BUCKLEY, William, and SMITH, Levi.—This invention, relating to the pistons of steam engines, and the buckets of air pumps, consists in expanding the metallic packings of pistons and pump buckets, by means of an annular helical spring. The wire or rod used in making this spring, may be either round, square, or flattened, and the transverse sectional form of the mandrel on which, during the process of making it is helically wound, may be either round, triangular, or other suitable shape. It is hardened and tempered in the usual manner, and before being bent round into a circle, and the ends fastened together, it should measure in length rather more than three times the diameter of the piston or bucket to which it is to be applied, so as to require compression before it will enter the space between the metallic packing and the periphery of the piston block. Instead of forming the annular spring with one unbroken length of helically coiled wire, it may be composed of two or three lengths, properly screwed or united together, so that if one part turn out weak or faulty, it may be renewed without the necessity for an entirely new spring.

[Printed, 8*d*. Drawing.]

A.D. 1866, June 27.—N° 1709.

FAIRBANK, William.—(*Provisional protection only.*)—This invention relates to "apparatus for generating and reserving "steam." Two vessels continguously set within brickwork are *employed.* The form of one of these vessels is spherical; it is set within the furnace over the fire. Into it the feed water is introduced from the feed pump by means of a pipe, which descends through the top of the vessel, and terminates about the centre, the end being furnished with a perforated hollow ball. The normal heat of the aeriform contents of this spherical vessel is to be maintained at 350 to 400° Faht. This vessel, which is termed the "generator," communicates by a suitable pipe and valve with the "receiver," which is a cylindrical vessel with hemispherical ends, so placed in the flues which lead from the furnace, that the hot draughts therefrom pass along its sides before entering the chimney flue. The injected water passing into the ball issues through the perforations thereof in the form of fine spray, and is immediately converted into high-pressure steam, which passes out through the communicating pipe and valve into the receiver, and thence, as required, to its use.

[Printed, *4d.* No Drawings.]

A.D. 1866, June 27.—N° 1714.

JORDAN, John.—(*Provisional protection only.*)—This invention relates to the use, singly or in combination, of alcohol, ether, pyroxylic spirit, naphtha, or methylated spirit, in steam boilers or vaporizers, as a substitute for water, for generating steam or vapour by the application of heat, the fluid evolved to be used in engines of ordinary construction, in connection with surface condensers. The vaporizer preferred, is heated by aqueous vapour of high temperature, generated in a boiler wherein there is a continuous circulation of the water. The service pipes which communicate between the vaporizer and the engine, and also the engine cylinder or cylinders, are enveloped in jackets filled with aqueous steam. After condensation the fluid is returned to the vaporizer.

It is stated that "by the use of this invention the difficulties " and dangers incidental to ordinary boilers, arising from deposit, " incrustation, overheating of the plates, and explosion are " entirely obviated, and considerable economy over the ordinary " mode is obtained."

[Printed, *4d.* No Drawings.]

A.D. 1866, June 27.—N° 1717.

NEWTON, William Edward.—(*A communication from Henry Seagur Lansdell.*)—This invention, which relates to apparatus for raising and forcing water and other fluids, is applicable to the ejection of bilge water from vessels, to filling the tanks of locomotive tenders, and to other purposes. It consists of an upright pipe, the top end of which acts as or is connected to a delivery pipe or hose, and the lower end is forked, so as to divide into two branches, the extreme ends of which reach below the surface of the water supply. Between the forked branches, so as to direct a jet of steam immediately up the centre of the main pipe, is inserted the nozzle of a steam pipe, which in the case of a locomotive, is by suitable unions when required to be used, connected with the steam pipe of the engine boiler. When the steam is turned on, its impulsive force directed up the main pipe, overcomes the atmospheric pressure, and drives out the air contained in the pipe. The water in the reservoir, pressed upon by the external atmosphere, then rises in the pipe, and with the assistance of the impelling velocity of the steam, is driven upwards to the delivery hose in a continuous stream. The jet pipe at its lowest bend is furnished with a valve, for the purpose of discharging any water of condensation which may collect therein after use, such water in cold weather being liable to freeze. The whole of the apparatus may be disposed within and suspended to the revolving head of a tubular column erected over the reservoir or water supply, in order that it may be conveniently turned to deliver water in any required direction.

[Printed, 8*d*. Drawing.]

A.D. 1866, June 27.—N° 1720.

WEATHERDON, Baldwin Fulford.—(*A communication from Joseph Toth.*)—This invention relates to apparatus for the prevention of incrustation in steam boilers, by the use of which all feculent or foreign matter is abstracted from the feed water. The apparatus "consists of an upright cylindrical vessel 18 feet high " by 6 feet in diameter, divided horizontally in two compart- " ments, the upper one filled with feed water to the depth of " 12 feet, whilst the lower one, in connection with a series of " copper tubes passing vertically through the said water, is " charged with steam, by which the said water is caused to boil " and pass off in its heated state through the medium of open or " closed gutters or pipes (direct to the boiler tank), depositing in " its passage through the said gutters the sulphates, carbonates,

" and other salts of lime, magnesia, mud, or other solids, or
" incrustating sediment or furs; the flow or supply of water to
" the apparatus being maintained through the medium of a pump
" from a well or other source, and supplied as above in a pure
" state to the boiler."

[Printed, 8*d*. Drawing.]

A.D. 1866, June 28.—N° 1728.

CLARK, DANIEL KINNEAR.—This invention relates to the construction of locomotive tractive engines. The side frames are composed of iron or steel plates and are united at the ends by transverse plate frames. The steering apparatus is mounted on an upright frame in front, where by the aid of a handle, the fore axle or carriage by means of two screws connected by tooth wheels, and two short links attached respectively to the screw nuts, actuate the vertical spindle to which the fore axle is connected. The steam cylinders are disposed at an angle upon the side framing towards the front, the piston rods working in the direction of a transverse crank shaft, disposed beneath the fore end of the boiler, parallel with and a little above the level of the axle of the driving wheels, which is placed directly under the mid-length of the boiler. Upon the ends of this shaft are two crank arms, to which the piston connecting rods are coupled. The driving wheels, which run on a wider track than the fore wheels, carry internal gearing, and are set in motion by two pinions on a shaft intermediately placed between the crank shaft and the driving wheel axle. By means of differential gearing upon the intermediate shaft and crank shaft, different speeds may be obtained. The water tanks are placed on the side frames beside the steam cylinders, and the coal boxes on each side abaft the driving wheels. The boiler is of the ordinary construction for such a class of locomotive engine. Sand boxes, whence sand is distributed on the road in front of the driving wheels, are in some cases employed, and the exhaust blast within the chimney is divided into severa jets to prevent noise.

[Printed, 10*d*. Drawing.]

A.D. 1866, July 2.—N° 1757.

APPLEBY, CHARLES JAMES.—(*Provisional protection only.*) —*This invention, relating* to locomotive and traction engines, consists, 1st, in the use of grooved friction gearing for transmitting motion to the driving wheels, the advantages being working motion without noise, and the capability of being thrown in and out of gear, by the use of ordinary excentric bushes, while working at full speed.

2nd. Fixing, to act upon the same shafts, corresponding friction wheels for high and low speeds. At starting, in order to overcome inertia, the pair of wheels of greatest power but slowest of speed is employed. These wheels are to be thrown out of gear when the load is in motion, and the higher speeded wheels brought into operation without stopping the train.

3rd. Relates to the bearings of the driving wheels, which are so arranged, that whatever may be the play upon the springs, the centres of the gearing wheels always remain equidistant.

4th. Relates to, for the purpose of passing over light "metals" or a temporary road at high speed, making "the engine frame of " sufficient length to take a truck, body, or other receptacle for " useful weight, so that this weight might be used when required " to increase the tractive power and dispensed with when it was " not required, as, for instance, when the train of trucks was " running empty."

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 3.—N° 1767.

ADOLPH, William.—(*A communication from Jules Claude Louis Charnoz.*)—"This invention has for its object improve" ments in apparatus for obtaining motive power by means of " steam. For this purpose two or other number of vessels are " employed, which are each supplied with liquid from a reservoir " through a passage fitted with a valve opening inwards into the " vessel. Steam is also supplied to each of the vessels by means " of a valve, and when the valve is opened, and steam admitted " to the vessel, the liquid is ejected through a valve opening out" wards into an air vessel, from which a passage leads to a tur" bine. The turbine is caused to rotate by the current of liquid, " and gives motion to any machinery with which it may be " coupled. After passing from the turbine the liquid returns to " the reservoir, from which it again flows into the first-mentioned " vessels to be again expelled by the action of the steam. The " valves for admitting and cutting off the steam may be slide

" valves, or valves of other construction, which alternately admit " steam to the vessels, and then put them in communication with " the air. Whilst the vessels are in communication with the air " they fill with liquid from the reservoir, and afterwards the " steam expels the liquid and causes it to pass through the tur-" bine as already described; the vessels are caused to work alter-" nately. If desired, a condenser may be employed, with which " the vessels are put into communication in place of with the " atmosphere, as above described. The liquid employed may be " oil or other liquid capable of being heated without pressure to " a temperature equal to that of the steam employed."

[Printed, 8*d*. Drawing.]

A.D. 1866, July 4.—N° 1777.

HENRY, MICHAEL.—(*A communication from Léon Foucault.*)— The patentee, respecting these improvements in governors, states as follows:—" The invention, as communicated to me by the said " Léon Foucault, is described in the following terms:—In the " Specification of a British Patent obtained by me, numbered " 3169, and dated 21st December 1864, I described various ar-" rangements of centrifugal action governors, all having for their " object to render the speed of rotation independent of the dis-" tance between the weights, and I applied the term 'isochro-" 'nism,' to the property or characteristic common to these " various arrangements; but in seeking to apply the new " principle of construction to steam engine governors with strict-" ness I found that the arrangement had a tendency to depart " from a regular or uniform motion, and to acquire a velocity " sometimes greater, and at other times less than the mean " velocity. In endeavouring to obviate this objection I have at " length ascertained that the real method consists in communi-" cating motion to the weights of the governor by the interven-" tion of appliances capable of being acted upon by the variation " which precedes and effects change of velocity."

The new principle of construction consists, " first, in rendering " the governor weights independent of the axis which carries " them, and as free thereon as possible; secondly, in communi-" cating motion to them by means of a bush, ferrule, or tube " having a helicoidal or spiral screw thread thereon, and fitted " on a portion of the axis, which is screw threaded in like " manner, *so that* the two take into each other like a nut and

" screw. The direction of spiral curvature is so arranged with " respect to the direction of rotation of the governor that by the " increase of speed the reaction exerted on the bush in the direc- " tion of the axis will tend to throw out or separate the weights, " and decrease of speed will produce a contrary effect."

[Printed, 1*s*. Drawings.]

A.D. 1866, July 5.—N° 1781.

FOWLER, Robert. — (*A communication from Edwin Parke Quadling.*)—" This invention has for its object the obtaining a " comparatively light engine with great tractive power and with " great flexibility as to its bearing points upon the rails both in " the vertical and horizontal planes." The boiler and its appurtenances are disposed towards one end of a long under main frame, and the tender is mounted thereon towards the opposite end. The frame is supported by two bogie frames, respectively disposed one beneath the boiler, and the other beneath the tender. Each bogie frame carries two steam cylinders, and is mounted on two or more pairs of wheels, which may be coupled, one axle and pair of wheels being driven by the cylinders. The main frame rests upon adjustable buffer springs attached to the four corners of each bogie frame. In the steam communication, between the boiler and each pair of cylinders, are interposed semi-spherical socket joints, which leave the frames liberty to lock without restraint. The reversing and regulating gear of both sets of engines are worked by one handle, altho' two if desired may be employed.

The roof of the boiler fire-box inclines from back to front, and the fire tubes incline from the fire-box tube plate to the smoke box at the back of the boiler, in order that each section respectively may be well covered with water during the ascent or descent of inclines. In order to equalize the fire draught, three sizes of fire tubes are employed; the smallest in diameter are ranged in horizontal rows at the top of the group, the medium size form a similar range in the middle of the group, and the largest are disposed in a horizontal range at the bottom.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1866, July 5.—N° 1784.

BRUNTON, John Dickinson.—This invention relates to *mechanical* apparatus combined with steam or other power, for sinking shafts or pits, and driving tunnels and galleries. The tunnelling machinery comprises a central frame, which rests upon rollers fitted to the lower ends of two vertical standards, one supporting the fore part, and the other the after part of the apparatus, on a central duplex rail. The central space, or longitudinal axial line of the tunnel, is occupied by a strong tubular screw shaft, which rests in a coupled bearing at the front end of the machine. Passing through this screw shaft, and projecting thereout at each end, is a central shaft, which rests in a coupled bearing at the back end, and carries a toothed bevel wheel, which by engaging with a similar wheel in connection with the power, imparts rotary motion to the central shaft. A slow advancing motion is communicated to the apparatus by the rotation of a worm wheel; this wheel, driven by a worm, is fixed on the fore end of the screw shaft, whereon is a strong nut, to which are jointed, so as to project radially upwards at an angle in relation to each other of about 120°, and somewhat inclining backwards, two shoreing props, the ends whereof are furnished with adjustable sole plates, which by means of screws are caused to press against the roof of the tunnel, and not only afford lateral support to the machine, but prevent both lateral and backward movement. Fixed on the extreme fore end of the screw shaft is a strong cross head, which carries two toothed wheels. These wheels have three projecting arms respectively to carry the cutting tools, which operate against the face of the rock, and at the same time, as the wheels are slowly carried round by the cross head on the screw shaft, revolve on their own axis, which motion is caused by a central wheel fixed on the extreme end of the central shaft. The steam or compressed air engine may either be attached to the framing, or made to transmit power to the apparatus by means of strap pulleys or gearing.

For sinking shafts, the apparatus, which is actuated by a pair of oscillating engine cylinders mounted on the sole plate, requires considerable modification.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, July 6.—N° 1787.

GHESNEY, William.—This invention relates to the construction of cocks or stop valves, for steam, water, and other purposes.

The working parts of an ordinary bib cock, consist of a valve with a circular face, and a square back which fits into a square guide, formed across the valve case. A hole is centrally sunk into the valve through the face, and screw threaded to receive the end of the spindle, upon which is cut a corresponding screw. The spindle enters through a stuffing box; a collar on the spindle, resting upon the bottom of the packing chamber, is pressed upon by the packing when the gland is screwed down, so that the spindle has liberty to turn but not to rise, whilst the valve has liberty to rise or fall, but cannot turn by reason of the square guide at the back when the rotary motion is imparted to the spindle, which moves the valve to and from its seat by means of the screw. The flow of the liquid from one section to the other of the valve case is upwards, and the valve opens in the same direction, and is closed against it. Modifications are described and illustrated.

[Printed, 8*d*. Drawing.]

A.D. 1866, July 6.—N° 1788.

AYDON, ENOCH HARRISON, and FIELD, EDWARD.—This invention relates to apparatus adapted to draw, induce, or cause the flow of aqueous and aeriform fluids and vapours. These effects are produced by means of pipes or channels, so concentrically arranged as to form two separate fluid ways, one within the other, one connected with a fluid in motion or under pressure, and the other with the fluid which is to be caused to flow, so that when a current of superior velocity is coursing through one channel, it induces in the same direction through the other channel, a flow of liquid from an inactive source. Nine adaptations of the invention are described.

1st. Relates to discharging bilge water from a ship, by means of tubular apparatus attached externally to the sides of the vessel; the water through which the ship is passing flows through the tube, and induces an effluxion of the inactive liquid from the hold of the ship.

2nd. Drawing bilge water from the hold of a ship, by the impulsive velocity of jets of steam.

3rd. Drawing bilge water from steam vessels by means of the impulsive force of the water necessarily required to be discharged from the boilers.

4th. Employing jets of steam, instead of air pumps, for the purpose of exhausting vacuum pans, and the condensers of steam engines.

5th. Employing jets of steam for the purpose of inducing draughts of vitiated air from ships and vessels, and thereby promote ventilation.

6th. Ventilating railway and other tunnels by means of expulsive currents of superheated steam.

7th. Inducing by steam currents a flow of the exhaust steam from steam engines and other sources through superheaters, for the purpose thereby of generating steam in other vessels.

8th. Causing a flow of condensing water through surface condensers by means of steam inducing currents.

9th. Employing steam inducing currents in connection with fire engines, for the purpose of drawing and forcing water.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1866, July 6.—N° 1789.

SALMON, John Aiken.—This invention relating to furnaces consists "in extending the space of the furnace beyond the fire-" bars, such extension forming the upper surface of a hollow" receiver for fuel, which is fed into the same through the 'ash-" 'pit' and beneath the ordinary fire-bars, the bridge of the fur-" nace being placed at a short distance from the point where the" extended furnace terminates. The extended portion of the fur-" nace becoming excessively heated by the fuel it contains effects" a thorough combustion of the gasses evolved from the fuel on" the ordinary fire-bars as such gasses are passing over the" same into the flue." Also applying external furnaces to steam boilers constructed without internal fire-boxes. These furnaces are formed by fire brick at each side of the boiler, after the manner of constructing external side flues, only that instead of having a smooth internal surface, they are formed in a series of steps or levels, whereon the burning fuel rests and is consumed, the residuum ash gradually sinking upon a grid, which is centrally disposed beneath the boiler, and serves for both furnaces. The fuel is fed through furnace doors, which open in front to the ends of the furnaces, about on a level with the centre of the boiler, where, as well as at the front of the grid below, ventilators are provided for the admission of the requisite quantity of air to support combustion.

[Printed, 10d. Drawing.]

A.D. 1866, July 6.—N° 1792.

LISHMAN, THOMAS.—(*Provisional protection only.*)—This invention relates to the construction of steam boilers, so as to obtain strength and render ordinary stays unnecessary, by forming as many of the parts as may be, circular or cylindrical. The body of a marine boiler consists of a horizontal cylindrical shell, to which, at each end, is attached a vertical cylindrical furnace section, respectively covered by hemispherical domes, and containing circular fire-boxes with dome-shaped tops. Annular water spaces surround the fire-boxes, which are also covered with water spaces. A combustion chamber is constructed within the body of the boiler about its mid-length, wherein, by means of one or more flue tubes, disposed at an angle to the plane of the boiler, the products of combustion are received from the two furnaces, and the hot draughts pass thence through an uptake to a chimney, which is mounted upon the boiler, and at its base is surrounded by a superheating chamber. Cylindrical wells fitted with blow-off cocks are constructed beneath the boiler to receive accumulations therefrom. To locomotive boilers, only one furnace section is attached.

[Printed, 4*d.* No Drawings.]

A.D. 1866, July 9.—N° 1802.

ELDER, JOHN. — This invention relates to marine steam engines, which, in order to obtain economy in fuel, are arranged to be worked on the double cylinder expansion principle, comprising, with a view to diminish cost, a single small high-pressure oscillating cylinder, working in conjunction with a fixed single large low-pressure cylinder. The low-pressure cylinder, in one of the modifications described and exhibited on the drawings, is seen fixed in an inclined position upon a cast metal framing, with the piston rod pointing obliquely upwards in the direction of the crank shaft, directly under which the small oscillating high-pressure cylinder is mounted on trunnion bearings, the head of its piston rod being coupled beside the couplings of the connecting rod of the large cylinder on the same throw pin of the crank. Both cylinders are steam jacketed, and provided with ordinary slide and other valves, the low-pressure cylinder having a cut-off valve in addition. The steam exhausted from the high-pressure cylinder, enters a receiver, which may be an interposed enlargement in the passage from the small to the large cylinder, otherwise the steam is conveyed to a compartment in the boiler, and there reanimated before its use in the low-pressure cylinder. The condenser and the various pumps are disposed between the two cylinders. These engines are designed to drive paddle wheels.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, July 10.—Nº 1808.

CLARK, Stewart.—(*A communication from John Morris Phillips and Joseph Hewes.*)—(*Provisional protection only.*)—This invention relates to the arrangement and working of the valves of steam engines, which valves are operated by means of a revolving crank. The crank gives vertical motion to a sliding block, within which there is a small slide, also simultaneously operated by the crank. This small slide carries a projecting curved piece, termed the "cut-off toe." The end of the vertical slide valve spindle rests upon a horizontal rod, one end of which is connected to the governor, and the other end rests upon the inclined surface of the cut-off toe. The variations of the governor, in accordance with the speed of the engine, give more or less longitudinal motion to the horizontal rod, so as to alter the resting point of its extreme end upon the inclined curved surface of the toe, and thereby lessen or increase the length of the stroke of the valve spindle, which in one direction depends upon the vertical motion of the sliding block, the return motion of the valve being effected by means of a strong spring. The empty space in the valve box is filled up by a collar through which the valve spindle works.

[Printed, 10*d.* Drawings.]

A.D. 1866, July 10.—Nº 1811.

HOWARD, James, and BOUSFIELD, Edward Tenney.—This invention relates to "that class of steam boilers which are
" formed of sections or groups of vertical tubes, around which
" the flame and heated gases of the furnace are free to circulate,
" the chief objects being to facilitate the disconnection of the
" tubes with the view to the replacement of any that may be
" injured, and to provide for the free circulation of the steam in
" the boiler. The lower ends of the tubes of each section we fit
" into sockets or annular recesses formed for them in a transverse
" pipe, which serves to connect the water space of all the tubes
" together. The tubes are bedded on vulcanized india-rubber or

" other suitable substance, and are held in place by screw bolts. " The tops of the tubes are by preference closed permanently by " welding or casting a cap upon them, and in order to lead off " the steam from the top of the tubes a central hole is tapped " into the caps to receive a screwed tube which is similarly con- " nected with a transvere steam pipe. The joints of these " screwed tubes are made good by nuts and elastic washers. All " the tubes therefore of one section discharge their steam into " the same transverse steam pipe, and the steam pipes of the " several sections all connect with a main longitudinal steam pipe. " When it is required to disconnect any one of the vertical tubes " the nuts on the screwed tube are to be slackened, and this tube " is then to be raised clear of the cap into which it was inserted. " The bolts at the foot of the tube are then to be withdrawn, and " the tube will then be free to be lifted out of its seat."

[Printed, 8*d*. Drawing.]

A.D. 1866, July 11.—N° 1813.

HAWKSLEY, George William, WILD, Matthew, and ASTBURY, Joseph.—This invention relates to the so constructing furnaces in two sections within the flues or internal parts of steam boilers, that while the fire in the front section shall be primarily occupied in generating steam in the boiler, it shall also heat the back section of the furnace, wherein the process of puddling metal, or of boiling or heating other materials, is to be simultaneously carried on. For these purposes the furnace occupies a considerable portion of the length of the boiler flue, and is divided by the bridge, on each side of which, through the shell of the boiler, there is an opening into each section, the front one for supplying fuel to or otherwise attending to the fire, and the other for the convenience of carrying on the puddling or other operation within the back section, both openings being closed with suitable doors. An arrangement of water tubes is disposed under the plates which form the bottom or sides of the back section or furnace chamber, in order that by keeping up a circulation of water, the plates may be kept at a moderate temperature. According to the modifications described and exhibited, these boilers are also constructed with a double furnace towards each end, divided by a water space partition.

[Printed, 10d. Drawing.]

A.D. 1866, July 11.—N° 1822.

FRASER, Robert William.—(*Provisional protection only.*)—This invention, relating to apparatus for obtaining motive power, actuated by steam, water, or other fluid, it is stated, may be advantageously applied where high speeds are required, and economically for auxiliary purposes, as the heat and power can be utilized without loss after passing through the engine, which comprises a cylindrical case, wherein, fixed upon a longitudinal axis, which passes concentrically through fluid-tight bearings or stuffing boxes fixed respectively on the ends of the cylindrical case, is a screw or instrument with radiating blades helically curved. One end of the case is furnished with an inlet, opening to the steam supply and governed by a valve, and at the other end there is an outlet for the egress of the steam, which passes through the instrument in a constant stream, and acting by the force of impact upon the blades, they together with the shaft are caused to rotate. It is proposed that the steam after emission, may be employed to drive an ordinary engine, or for heating purposes.

A modification of the first arrangement is described, and reference is made to a "direct-acting swivel float propeller," which the inventor has described in the Specification of a former Patent dated October 5, 1865, No. 2563, and which it is proposed to drive by two apparatus, constructed according to the present invention, and acting as auxiliaries to a pair of ordinary engines, which would receive the steam emitted from the two apparatus.

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 11.—N° 1824.

NAYLOR, William.—This invention relates to steam engine valves, the object being to economize steam, and avoid "compression" when working steam expansively. Two piston valves working in separate cylindrical valve chambers are employed; these valves are actuated independently of each other by separate excentrics or otherwise. One, the steam valve, regulates the ingress and egress of the steam to and from the cylinder, and the other or expansion valve, regulates the cut-off. The steam valve consists of four pistons, arranged, a pair near each end, upon a valve spindle, to work in a cylindrical steam chamber, which extends *rather beyond* the full length of the main cylinder, into the ends of which, ports open from the valve chamber, one from between each pair of pistons, and other ports communicate therefrom with the ends of the expansion valve chamber. which contains two pistons, one to work each port. The steam from the boiler is admitted into the expansion valve chamber between the pistons, the movements of which cut off its admission into the main cylinder at any regulated time, before the respective ingress ports are covered by the steam valve. These valves are always in a state of equilibrium. The exhaust takes place through the ends of the cylindrical steam valve chamber.

[Printed, 10*d.* Drawing.]

A.D. 1866, July 12.—N° 1829.

READE, William.—(*A communication from Henry S. Lansdell.*) —(*Provisional protection not allowed.*)—" This invention relates to " . . . . the construction of steam pumps, called steam syphon " pumps, for which Letters Patent were granted to William " Edward Newton, of date the 23rd day of January, A.D. 1864, " No. 198."

The object of the invention " is to effect by the employmen of " the same volume of steam at like pressure the raising of a " larger quantity of water than could be raised by pumps con- " structed in accordance with the Specification of the Invention " patented as above-mentioned, and this, that is the raising of a " larger quantity of water is effected by employing for each " pump two or more supply pipes instead of one connected or " opening into the steam chamber or vessel, such steam chamber " or vessel and the steam and delivery pipes being constructed as " described in the Specification above-mentioned. Or an " approximate result is obtained by making from one supply " pipe two or more openings or connections into the steam cham- " ber or vessel."

[Printed, 4*d.* No Drawings.]

A.D. 1866, July 12.—N° 1831.

READE, William.—(*A communication from Henry S. Lansdell.*) — (*Provisional protection not allowed.*)—This invention relates to supplying water to the tanks of locomotive engines and tenders, proposeing to raise it from wells or sunken reservoirs, by steam taken from the boiler of a locomotive during the time it has come to a stand at a station. The apparatus "consists of "five main parts; first, a supporting column or frame; second, "a steam pipe, either flexible or jointed so that it can be readily "connected to the locomotive boiler; third, a steam chamber of "cylindrical or other shape into which the end of the steam pipe "projects; fourth, a supply pipe or pipes, the upper end or ends "of which terminate in the steam chamber and the lower enters "or dips amongst the water to be raised; and fifth, a delivery "pipe connected into the steam chamber and led therefrom up-"wards and outwards laterally. . . . When steam is allowed "to flow from the boiler through the steam pipe into the steam "chamber a vacum or partial vacum is created, and the water "into which the supply pipe enters or dips is forced by atmos-"pheric pressure and drawn by the current of steam through the "said supply pipe, the steam chamber, and the delivery pipe "into the tank, and this continues as long as steam is allowed to "flow."

[Printed, 4*d.* No Drawings.]

A.D. 1866, July 12.—N° 1832.

CLARK, William.—(*A communication from Gebhard Hagenmeyer.*)—"This invention relates to an oil or grease cup which is "provided with two cone valves, the stems of which are connected "so that they are compelled to turn together, but free to move a "short distance towards or from each other; these valves close "into corresponding seats, and from their peripheries project "studs which work against circular, inclined, or spiral planes "surrounding the seats, and arranged so that the highest part of "one of these spiral planes is in a line with the lowest part of "the other in such a manner that when the valves are subjected "to the action of a suitable spring, which has a tendency to keep "the same closed, by turning the valves one will open when the "other closes, and vice versa, and the globe of the grease cup is "alternately brought in connection with the supply cup, and then "with the steam chest or other part to be lubricated."

[Printed, 6*d.* Drawing.]

A.D. 1866, July 13.—N° 1842.

ROGER, Robert.—This invention relating to steam travelling cranes, "*consists in* constructing the central posts or spindles

" round which cranes revolve . . . hollow, and in conveying " through this post the motive power for causing the crane to " travel. If the motive power is to be obtained from the engine " or engines of the crane above, the power is conveyed to the " lower or travelling part of the crane through the hollow spindle " by means of a shaft driven above, as may be most convenient, " and applied to driving the travelling wheels in any manner " found most suitable."

The crane exhibited is of the ordinary construction, comprising the central column with the frame and fittings, and having a steam cylinder and boiler mounted on a horizontal revolving platform, disposed on a railway truck or crane carriage. Suitable gear is arranged for working the lifting chain, turning the crane round its centre, and operating on the travelling wheels so as to produce a movement of the carriage in either direction upon the rails.

" In cases where a separate engine or engines is or are employed " on the travelling part of the crane as the motive power for " causing it to travel, I convey the steam for driving the engine " or engines from the boiler or boilers of the crane through the " hollow spindle to the cylinder or cylinders below in any con- " venient manner, the steam passing from the boiler to the top of " the spindle by means of a pipe and valves connected by a gland, " and the steam passes from the bottom of the hollow spindle " to the cylinder or cylinders underneath; or I pass it by an " independent pipe through the hollow or aperture of the spindle. " By passing the motive power, either by a shaft or by steam, " through the central spindle of the crane, as before described, " the action of the crane is equal in all its points round the said " spindle, and the crane will travel with or without its load in any " position round that centre."

[Printed, 10*d*. Drawing.]

A.D. 1866, July 14.—Nº 1848. (* *)

JUSTICE, WILLIAM. — " Improvements in motive-power " engines."

The improved engine " consists of a box or chamber in which " three revolving cylinders are placed; the axles of these cylinders " pass through or beyond the sides of the chamber, and at one " end are geared into each other by spur wheels or pinions. The

" other half of the axles is made hollow and their extremities pass " through a water or steam box with a cock or valve in it, by " which the flow into the moving parts of the engine is regulated. " Of the three cylinders constituting the moving parts, the two " outer ones are formed with a tongue on them, which bears con- " tinuously against the inner face of two cylinders formed by the " case before-mentioned; an opening passes from the passage " in the axles of the two outer cylinders, and its outer edge is " situated nearly close to one side of the tongue. . . . The " central revolving cylinder rotates at the same rate as and in " contact with the two outer ones, and in it a recess is formed, " into which the tongue falls as each of them approach each " other during each revolution. The central revolving cylinder " thus forms as it were, a continuous abutment for the actuating " liquid or fluid to press against, forming a shoulder, from which " the pressure is transmitted to the tongue on the two driving " cylinders. As soon as the driving cylinders have nearly com- " pleted a revolution the tongue passes over a port through which " the water which has caused the rotation continuously escapes " without any interruption. As the frictional contact of the " outer edge of the tongue against the inner surface of the cylin- " der would cause the edge to be worn away, to prevent this a " leather packing is placed over the tongue, against which the " water or other liquid or fluid passes, and thus the action of the " liquid or fluid keeps the revolving cylinder continuously with- " out leak against the inner surface of the cylinder."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, July 16.—N° 1855.

NORTON, James Lee, and BÜNGER, Frederick Ludovicus Henri William.—(*Provisional protection only.*)—This invention relates to apparatus for discharging the water of condensation from pipes or vessels in which steam is employed. It is stated to be "applicable to apparatus acting in the manner " described in the Specification of a Patent granted to Frederick " Ludovicus Henri William Bünger, dated 27th day of October, " 1862 (No. 2890)."

According to the present invention, the vessel or casing which receives and discharges the condensation water may be spherical and made *in two halves*, the upper being by means of an inlet pipe connected to the apparatus in which the steam is employed. An adjustable rod or spindle through a passage or stuffing box in the upper half descends into the vessel to a depth regulated outside by a screw nut or otherwise. Attached to the lower end of the spindle, filled with water, is a cylindrical vessel, the top and bottom of which are each closed by a flexible concentrically corrugated disc of thin metal. At the bottom of the casing there is an outlet closed by a valve, the spindle of which is attached to the centre of the lower disc or flexible bottom of the cylindrical vessel. The valve is protected by a covering of wire gauze, and so long as steam pervades the interior of the casing, it, by reason of the heat and expansion of the water in the cylindrical vessel, remains closed, but when the water of condensation accumulates in the casing, and a general cooling takes place, then the volume or bulk of the water in the vessel, in consequence of the lowering temperature, contracts or diminishes, the valve is raised, and the discharge takes place.

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 18.—N° 1868.

PLANT, GEORGE.—This invention relates to apparatus employed in the manufacture of tapering and other tubes, and in forming flanges thereon. The tapering tubes are employed more particularly in the construction of such steam boilers as are maufactured according to the Letters Patent granted to W. and J. Galloway, dated 11 March, 1851, No. 13,552. The present invention consists, when forming such tubes, in placing the skelp (or bended wrought iron or steel sheet) after it has been worked to the required form, and is heated to a welding heat, upon a strong horizontal mandrel, which projects from and is carried by a strong movable frame to which it is secured. This frame is brought under a steam hammer, which is caused to act by successive blows along the lapped edges of the skelp, so as to weld them together, the frame and mandrel being progessively moved, so that the blows of the hammer may fall with regularity along the whole length of the welded seam. The flanging of the tubes is a subsequent operation. The end of the tube when sufficiently heated is so introduced between the two halves of a die that a *portion* of the extreme end, sufficient to form the flange, is left *projecting*; this end is then opened or distended by a tapering plug, and afterwards flattened down upon the face of the die by suitably formed plugs and swages, connected to or acted upon by the hammer block of a steam or other hammer, or by the ram of an hydraulic press. During the operation, the lower end of the tube rests upon an adjustable base, whereby the tube is held at a suitable inclination in relation to the required angle of the flange.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, July 21.—N° 1890.

TROTMAN, Henry.—This invention relates to a feed box for marine boilers, which box is so constructed as to be able to arrest the impurities with which the condensed feed water is charged. The feed box is closed, and contains two transverse perforated plates towards the ends, dividing the box into three compartments. Metal bars or tubes parallel to each other are placed through the holes in the plates, so as, without touching each other, to occupy the internal space and the two end spaces, by projecting through the perforated plates towards the ends of the box, where at each end a zinc plate is interposed. Another zinc plate is placed along the bottom of the box, and others along the sides of a shallow upper compartment, which is divided from the body of the box by a horizontal plate, and which may be made deep enough to contain another group of bars or tubes. The box is so placed (by preference in the boiler) that the feed water pipe communicates with the central bottom compartment, whence the water flows into the end compartments through additional holes made towards the side through the perforated plates. The water then takes an upward course through holes in the horizontal plate into the upper compartment, and thence out through the holes in the cover of the box into the boiler. The internal fittings of the box, which are capable of modification, are loosely placed therein in order to be easy of removal when the apparatus requires cleaning.

[Printed, 8*d.* Drawing.]

A.D. 1866, July 21.—N° 1891.

SMITH, Hugh.—This invention relates to boring and rivetting apparatus, and the arrangements required for its use in the construction *of ships, boilers,* bridges, and other metallic structures.

The apparatus consists of a sliding frame, whereon is mounted a small steam cylinder containing a piston, the rod of which carries the head of the rivetting hammer. The valve, operated by tappets, is of the cylindrical class, as ordinarily used in steam hammers, and the arrangements are similar, excepting that springs are applied to mitigate the effects of concussion. Arrangements, by means of a chain and warping barrel, are provided for moving the apparatus as the work progresses, and also for rendering it capable, as much as possible, of operating at any desired angle. The motive agent, either steam or compressed air, is conducted to the cylinder through suitable pipes. This part of the apparatus operates outside the structure, to act in conjunction with which, mounted inside in a corresponding position is a holding-up dolly, which consists of a stout metal bar fitted to adjustable slides, supported on rails or bars. The end of the dolly is placed against the rivet head and held in position by means of springs, and when the rivet point receives the blow of the hammer, the reaction of the dolly causes the spreading of the rivet point. Steam drilling apparatus, furnished with countersinks and bits for cleaning off the rivets externally, and for dressing the edges of the plates, is arranged and mounted in the same manner.

The rails or rods whereon the rivetting apparatus is mounted, can be adjusted and arranged at any suitable elevation, and fixed by means of tie links and cotters, stays, and other suitable movable contrivances, to the frames of the ship or structure.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1866, July 21.—N° 1901.

NEWTON, Robert.—This invention relates to apparatus for consuming smoke, applicable to steam boiler and other furnaces. As applied to a horizontal steam boiler with an interna tubular furnace, it consists in forming an arch of brickwork at the front end, and leaving passages within the brickwork for the introduction of two or more pipes, the ends of which project beyond the brickwork a short distance into the furnace. The outer ends of these pipes are connected to an air tube in front of the boiler, which tube is furnished with a regulating valve, and has a constant current of the atmosphere blown through it by means of a fan conveniently placed upon the top of the boiler. The apparatus may be used alone, or in conjunction with an "improved steam generator," for which Letters Patent, bearing date March 24, 1866, No. 878, were granted to this inventor. In some cases the air, instead of being distributed in the furnace, is conveyed to the back of the bridge, and there discharged through fire-clay pipes.

[Printed, 10*d*. Drawing.]

A.D. 1866, July 21.—N° 1903.

MITCHELL, Robert.—The invention relates partly to improvements on a former invention, for which Letters Patent were granted to James Alfred Shipton and the present inventor, bearing date January 19, 1865 No. 165. The object of the present invention, is the employment, in addition to the apparatus previously described for manufacturing and forcing gas fittings by steam machinery, of a pair of clams, swages, or moulding jaws, which are caused to close with force upon the forging, so as to impart thereto the desired shape and finish. In combination with these moulding jaws, a pair of converging dies are employed, which instead (as formerly described) of embracing half the forging or article under operation, close respectively upon one quarter of its circumference, the two other, or opposite quarters being operated upon by the moulding jaws, which may be opened and closed by any convenient mechanical arrangements such as (for example) a wedge action, a link, or a system of toggle-jointed levers brought into action at the proper time by the vertical steam cylinder. Three steam cylinders are employed; the pistons rods of two, which advance at an angle from opposite directions, work the welding dies with lateral pressure, and the inverted vertical cylinder, the piston rod of which is keyed to a slide which operates the moulding jaws and carries a projecting bracket whereto the vertical mandrel is secured, is disposed intermediately above.

The invention also relates to a provision, in connection with the cylinders of forging and welding, and bending or shaping machines, for confining the steam or other elastic fluid above the pistons, so as to form cushions between them and the cylinder covers, in order that when the steam or fluid is admitted, the pistons may not be forced into contact therewith. The valves are worked by levers, which are operated by the hand of the workman. This part of the invention is applicable to double-action steam hammers, in use for *general purposes.*

[Printed, 1s. Drawing.]

A.D. 1866, July 23.—N° 1909.

RAMSBOTTOM, John.—(*Provisional protection only.*)—This invention relates to using and treating steam for obtaining motive power, and in the apparatus connected therewith. It consists of a generator or "vessel supplied with a small quantity "of water; heat is applied until this water becomes wholly "vaporized, the said vessel may afterwards be supercharged with "heat to a very considerable degree, inasmuch as no direct com"munication exists with other aqueous matter in liquid state. "The vapor is conveyed to a compound steam engine having "two cylinders parallel with each other, and so arranged in "size that one cylinder shall possess an area greatly in excess of "the other; on the said cylinders is cast a valve box, in which "are two valves worked simultaneously, and so arranged that "there shall be the least possible lap or lead, in order that the "steam may have the least possible expansion in the small "cylinder, and have the utmost freedom in discharge from both "on completion of the piston's stroke." The object "is to work "up as thoroughly as possible in mechanical effect the heat "contained in the vapor" which passes from the small to the large cylinder, expanding therein through the whole length of the stroke, and thence, in order to establish a slight uniform back pressure upon the large piston, and also to avoid the cooling effects which result from direct communication with the condenser, the steam is first received into a second vessel, whence it passes out through a slightly weighted valve, and is conveyed to the condenser, into which also the water of condensation passes from the second vessel by means of a "steam trap." From this source, by means of a pump, the generating vessel is supplied with water, no additional supply being needed, except to replenish what is lost by leakage.

[Printed, 4*d.* No Drawings.]

A.D. 1866, July 23.—N° 1913.

BOUSFIELD, George Tomlinson.—(*A communication from James Farquharson McKenzie.*)—This invention, relating to the production and superheating of steam, produces by independent distinct means, a continuous supply of superheated steam at a given temperature, and at a regulated pressure; for which purpose a series of pipes is transversely disposed in the flue chamber of a reverberatory furnace. The extreme ends of these pipes project through the opposite side walls of the furnace, where every succeeding two ends are united by tubular unions, so as to form a single continuous passage through the whole series from one end to the other. The feed water is introduced into the first pipe of the series, at the end nearest the furnace, and as it passes on through each pipe in succession, its temperature is gradually raised until it becomes steam, increasing in heat as it further travels on, until it attains a temperature at the other end of the apparatus of 400 Faht. At this point, underneath and inside the heating pipe, a thermostat is placed, the spindle from which, passing out through a stuffing box, is connected with a valve in the water feed pipe, whereby the supply of water to the apparatus is regulated. The steam pressure is regulated by the action of a piston, the rod of which is weighted to the pressure required. This rod is connected by suitable means with the flue damper, so as more or less to close the draught passage, and thereby reduce the heat in the furnace, and consequently the steam pressure.

[Printed, 10*d*. Drawing.]

A.D. 1866, July 24.—N° 1924.

VAUGHAN, Edward Primrose Howard.—(*A communication from Robert Breckenridge Baker, and Charles James Adolphus Dick.*)—(*Provisional protection only.*)—This invention relates to a mode and apparatus for preventing incrustation in steam boilers, which "is effected by attracting and conducting the
" electricity generated in the interior of the boiler by whatever
" means such electricity may be produced or evolved, or whatever
" may be its character, to the shell of the boiler. For this purpose
" metallic wires or points are placed in any convenient portions
" of the steam space of the boiler above the surface of the water,
" or in any other positions in which the electricity generated or
" evolved can be conveniently collected, such wires or points
" being attached to or connected with suitable metallic con-
" ductors, the latter being so arranged as to be in electrical com-
" munication with the shell of the boiler. The wires or points
" may be constructed of iron or steel, or of any other metallic
" substance or substances possessing the requisite conducting
" power, but wires or points formed of magnetised steel are found
" in practise to be best adapted for the purposes of this
" invention.

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 26.—N° 1939.

KOCHS, William Edward.—(*Provisional protection only.*)—This invention relates to steam engine slide valves, and to water valves. The object in view is to relieve such valves from back pressure, and this, instead of admitting the steam over the valve, is effected by introducing the steam "below the valve in "two parallel steam jackets cast in the body of the cylinder, of "which one is on each side of the openings or cylinder channels, "there are consequently five openings instead of three as "hitherto on the surface of the cylinder. The valve closing "tightly upon the cylinder surface will prevent the steam from "entering into the steam chamber. The valve has, ... "either one or two steam channels besides the exit opening; they "are so constructed that by return of piston the steam will enter "either full or with expansion at convenience from one steam "jacket direct through the valve channel into that side of the "cylinder where it is needed and the same by the return motion. "The pressure upwards from underneath the valve is counter-"balanced by a certain amount of steam pressure in the chamber, "which may be completely and accurately regulated by a safety "valve, thus giving either more or relieving the valve of its "pressure and friction. The same principle as before described "is equally applicable to water valves.

[Printed, 8*d*. Drawing.]

A.D. 1866, July 26.—N° 1941.

BONNEVILLE, Henri Adrien.—(*A communication from Henry Petitpierre.*)—This invention, relating to the generating of steam, consists of a "recipient" or superheating vessel or tube, which is placed in the fire-box of the boiler. The form of this receiving tube is arched, rising from the sides of the furnace over the hottest part of the fire. The steam pipes which convey the steam from the boiler to the engine cylinder, communicate respectively with the ends of the superheating tube, wherein, while passing through, the moist steam from the boiler is more completely vaporized and distended, in which state it passes to the engine, a valve being interposed between the superheating tube and the boiler, to prevent the regress of the expanded steam. *It is stated,* that more than 50 per cent. of fuel and of water is saved, and that boilers to which the apparatus is applied, need be only one half the ordinary capacity to produce the same result as those of full size, "the anhydrous steam giving more regular "working and a notable increase of force."

[Printed, 8*d*. Drawing.]

A.D. 1866, July 28.—N° 1955.

ABEL, CHARLES DENTON.—(*A communication from Michel Hervier and Léon Guizot.*)—This invention of apparatus for regulating the supply of feed water to steam boilers, consists of an upright cast iron casing, which is internally attached to the bottom of the boiler, and is provided at its upper end with a socket to receive the end of the feed pipe, which descends through the top of the boiler, and is fixed thereto by means of a flange. Two lateral branch openings from the case for the passage of the feed water, are governed by an intervening slide, attached to a lever, the movements of which are regulated by the height of the water level in the boiler, by means of a float suspended from the free end of a horizontal lever, the fixed fulcrum of which depends from the top of the boiler; the opposite end of the float lever, by means of a connecting rod, is united to the slide lever, which is lengthened beyond the joint to receive a counterbalance weight. To avoid oxidation, the slide and the facings of the feed water passages from the casing, are constructed of gun metal.

[Printed, 10*d*. Drawing.]

A.D. 1866, July 28.—N° 1957.

PHILLIPS-SMITH, JOHN.—This invention relates to traction engines, and is in part applicable to locomotive engines and wheeled carriages. It consists, 1st, in preventing accidents on railways, in the event of any part of the engine or driving gear giving way while upon an incline, by the use of a ratchet wheel fixed on the driving axle, and a dog or pawl attached to the frame; by these means under such circumstances the engine is prevented from running back, otherwise, when required to back the engine, the pawl must be raised; this however is not necessary during the forward movement. This part of the invention is applicable to carriage axles.

2nd, relates to the disposition of the steam cylinders of traction engines, which instead of being mounted on or about the boiler are, in order to avoid straining or causing the latter to leak, bolted on a transverse frame which is connected to the inside of the main framing, and is below the boiler, where also the crank shaft is disposed parallel to the axle of the travelling wheels, the shaft and axle being connected by suitable gearing, or by chain wheels and an endless chain. An additional shaft is required to carry the winding drums when the engine is employed in drawing agricultural implements, and for the pumps when employed in pumping.

[Printed, 1*s*. Drawings.]

A.D. 1866, July 28.—N° 1958.

CLARK, William.—(*A communication from Truman Merriam and James Cushing.*)—(*Provisional protection only.*)—This invention relates to rotary engines and consists 1st, " In the arrangement of a series of cylinders and pistons upon a revolving " drum mounted on a shaft in combination with a face plate and " ports, and adapted to segmental apertures in a stationary steam " chest in such a manner that a constant pressure of steam may " be alternately applied to the piston, where the leverage and " power of the engine will be increased without a corresponding " increase in the consumption of steam." 2nd. " In the arrangement of one or more curved tracks in combination with a " common cross head provided with trucks or pins, and with a " common reciprocating piston fitted in a cylinder, which is " secured to a revolving drum in such a manner that the reciprocating motion of the piston is converted into a vibrating motion " of the drum and cylinder, whereby a rotary engine of considerable power is obtained." 3rd. " In the arrangement of a " steam chest with an oscillating joint in combination with the " face plate of the cylinders, or of the drum containing the said " cylinders, in such a manner that the said steam chest can be " reversed one quarter, and the motion of the engine thereby " reversed."

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 31.—N° 1971.

BOUSFIELD, George Tomlinson.—(*A communication from Louis Elsberg.*)—This invention relates to the process, and machinery employed for the manufacture of solid fuel, or " Feugot

" coal," from peat and such like vegetable matter. The peat is first drained on its natural bed to the required depth, by cuttings of parallel ditches or open drains to carry off the water; the surface is then harrowed, or broken up by suitable implements worked by steam or otherwise. When dried, the peat is collected by a kind of road scraper, and stored in covered places. When about to be used, it is heated and moistened by steam in a tank or chamber, whence it is fed direct into the compressing machines. The heating and steaming process may be combined with, and work in conjunction with the presses; for this purpose a kind of pug-mill or circular chamber with a central revolving vertical spindle, fitted at intervals with radiating blades placed at suitable angles, may be employed, openings being provided at the bottom, whereout, the steamed material in a properly heated state, issues direct into the press mouths. Two pairs of presses, with the steaming and heating apparatus interposed, are described and illustrated. These presses, worked by motive power, consist of strong tubes, which are about 2½ inches diameter in the bore and open at both ends, are incliningly fixed upon the press frame at an angle of about 45°. A plunger actuated by a short throw crank, is fitted to work to and forth in each press tube, into which about its mid-length there is a slotted opening, which communicates with and receives the prepared material from the delivery passages at the bottom of the steaming and heating apparatus. The length of stroke carries the end of the plunger past the slotted opening, and the return stroke drives the material which has entered, down the press tube, each succeeding stroke carrying in a fresh quantity, and accumulating pressure upon that portion which is being driven through the tube, the outer end of which is fitted with an adjutage slightly tapering inwards from each end, so as to admit of a slight expansion of the compressed material before it is finally discharged.

[Printed, 10*d*. Drawing.]

A.D. 1866, August 1.—N° 1982.

ROBINSON, JOHN.—(*A communication from William Sellers.*)— This invention relates to " improvement in the Giffard Injector " described as self-adjusting in the specification of letters patent granted to A. V. Newton, April 12, 1865, No. 1051, and also to improvements in other Giffard injectors, the object being to are, in order to avoid straining or causing the latt bolted on a transverse frame which is connected to the main framing, and is below the boiler, where shaft is disposed parallel to the axle of the trav shaft and axle being connected by suitable gr wheels and an endless chain. An addition carry the winding drums when the engine i agricultural implements, and for the pu pumping.

[Printed, 1*s*. Drawings.]

A.D. 1866, July

CLARK, WILLIAM.—(*A com and James Cushing.*)—(*Provis* tion relates to rotary engir … ually
" ment of a series of c … end of a
" drum mounted on a s … ining tube, and
" ports, and adapted t … h a divergent tube
" chest in such a ma … , the axis of both tubes
" be alternately a … e line of the axis of the steam
" power of the e … discharging tube is cylindrical, and
" increase in th … ning screwed in a partition in the lower
" ment of or … shell; this bushing must be of sufficient
" common … nt the escape of water in any important quantity
" common … scharging tube is fitted so as to play freely through
" secure … combining and discharging tubes must have sufficient
" catin … t longitudinally to admit the maximum amount of
" of t … ent longitudinally … required between the exterior of the steam nozzle and the
" … terior of the combining tube; and to enable the instrument
" … lift water from a lower level there must be a stop provided
" which will prevent the combining tube from moving so far
" towards the steam nozzle as to close the opening for water
" entirely; in this case the piston will strike a small flange in the
" upper part of the case before the surfaces referred to can come
" in contact. This injector is provided with a starting cock and
" check valve," as described in Newton's self-adjusting injector.

To remedy a defect in the nozzles of the Giffard injector, the plug or cone spindle is made much longer than is customary, "and " a hole is drilled in its axis from its smaller end far enough to " *communicate* by means of a cross hole with the steam space in

" the steam nozzle after the plug or cone spindle has closed the " taper end of the nozzle. The size of the hole in the axis of the " plug or cone spindle should be about one-half that of the " smallest end of the divergent tube if intended to lift only; but " to obtain the smallest possible minimum delivery of water it " will be necessary to make the hole somewhat larger, in which " case a moveable plug must be provided passing down the axis " of the first-named plug or cone spindle to diminish the quantity " of steam when it is desired to lift the supply of water."

[Printed, 6*d*. Drawing.]

A.D. 1866, August 1.—N° 1985.

NEWTON, William Edward.—(*A communication from Clark Fisher.*)—The object of this invention is to promote and effect the rapid and economical combustion of fuel in steam boiler and other furnaces. It consists in forcing, by means of a fan or other blowing apparatus, currents or jets of air into the smoke pipe or chimney in the direction of the course of the draught, at a point above the level of the furnace or heating chamber, passing therein through a pipe at a velocity greatly in excess of the speed of the natural draught, which is thereby accelerated, and such an increased quantity of air is drawn into the fire-box, as to insure the combustion of the fuel and smoke.

" By thus forcing air in jets into the chimney of a furnace the " chimney will be kept at a comparatively low temperature above " a certain point, and hence is secured safety from fire where " chimneys or smoke pipes pass up through the decks of vessels " or through roofs of buildings. It is not only found by forcing " air under pressure into chimneys above the furnaces thereof that " the combustion in the furnaces is more complete, but it is also " found that bituminous or other soft coal can be burned very " successfully and economically with little or no escape of smoke " and gas."

[Printed, 8*d*. Drawing.]

A.D. 1866, August 6.—N° 2024.

JOHNSON, John Henry.—(*A communication from William Wright.*)—This invention relates to steam machinery for stamping and pulverizing ores, the lower ends of the steam piston rods being directly attached to the stamps, one cylinder and piston to each. Instead of as heretofore disposing the stamps in a row, they are placed quadrangularly, or circumposed round a centre, and inclosed by a screen or wire-work, through which the finely crushed material passes into a surrounding trough. The stamps, by means of inclined shoots, are fed through an aperture in the centre of the group from hoppers fixed to the sole plate, whereon are fixed the steam cylinders, which with their valves, as the stamps wear, are made adjustable in relation to the battery by placing adjusting nuts on the supporting columns, which are screw threaded. The slide valves may be of the piston form or otherwise; they are operated by means of a cone, formed on the upper end of each of the piston rods, which work in closed hollow columns, fitted on the ends of the cylinders. A sliding wedge on the end of a horizontal rod, enters laterally through a stuffing box into the interior of each column. When the piston rods rise, the cones, by pressing against the wedge, force it laterally and move the valve inwards, so as to admit the steam above the piston, the return movement of the valve being effected by the pressure of the steam. This movement of the valves is obtained by connecting their spindles, which are horizontal, to the lower end of a vibrating lever, the upper end of which is connected to the rod which carries the sliding wedge. The valve gear of each cylinder is independent of that of the others, so that the stamps are worked separately by their own engine. This mode of working slide valves may be applied to direct action power hammers.

[Printed, 1*s*. Drawing.]

A.D. 1866, August 8.—N° 2044.

ROBINSON, John, and SMITH, John.—(*Provisional protection only.*)—This invention, relating to the direct application of the motive power of steam or compressed air to saw frames, consists in the method employed for giving motion to the slide valves of the steam or air cylinders. The inventors state—" For this " purpose we employ a bar sliding with the reciprocating saw " frame, and carrying inclined pieces to act as tappets; these " inclines or tappets as they move upward and downward act " upon rollers, which by causing a shaft or lever to oscillate or " vibrate impart the necessary sliding motion to the valve. The " inclines or tappets or the rollers we make adjustable for regula- " ting the motion of the valve. The steam or air cylinder may be

" placed above or below the saw frame, and we provide the said
" cylinder with a separate steam or air pipe, by which the piston
" may be adjusted for starting. This arrangement may be modi-
" fied by connecting the oscillating or vibrating shaft to a slotted
" link attached to the saw frame, the said slot being provided
" with the necessary inclines for acting upon the shaft at the
" proper intervals for giving motion to the valve."

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 9.—N° 2048.

HARKES, George Bell.—This invention relates to rotary steam engines. Concentrically within an outer fixed steam cylinder, there is a cylinder of such smaller dimensions that an annular space is formed between them. The small cylinder is fixed upon and gives motion to a shaft which rests in suitable bearings outside. A projecting piston is longitudinally attached to the periphery of the inner cylinder, dividing and extending along the annular space, and packed at each end to revolve in steam-tight frictional contact with the ends of the outer cylinder, and longitudinally along its edge which slides round in contact with the inner surface of the latter cylinder, at the upper part of which are the steam admission and exhaust ports. " A portion of the upper
" part of the steam cylinder is removed for the admission of a
" block, the lower surface of which is of the form of the segment
" of a circle, a casing or shell being provided for the said block
" to work in. A shaft is attached eccentrically by one end thereof
" to the exterior of the piston cylinder, the other end of such
" shaft being attached to the segmental block. By the revolution
" of the piston cylinder the segmental block is caused to oscillate
" through the steam space of the steam cylinder, the lowest part
" of the surface thereof working against the surface of the piston
" cylinder between the ports, and thereby acting as an effectual
" stop between the steam and exhaust ports. Upon the steam
" being admitted into the steam space of the cylinder it impinges
" upon the piston, causing it to revolve until it has passed the
" exhaust port, when the steam escapes; the piston moves
" through the small space between the exhaust port and the
" steam port by means of the momentum it has acquired, aided
" when necessary by the action of a fly wheel, and having passed
" the steam port the steam is again admitted, the steam space
" *between the steam* port and the exhaust port being stopped by

" the before-mentioned block, and thus a continued rotary motion
" is obtained."

[Printed, 8*d*. Drawing.]

A.D. 1866, August 11.—N° 2064. (* *)

KEIRBY, JOHN EDWIN.—" Improvements in packing for steam,
" water, air and gas-tight joints."

" My said invention relates to that description of packing
" usually termed rope packing, and which is made by covering
" wire with hemp or other fibrous material saturated with red
" lead, and my said invention consists in combining india-rubber
" or other flexible substance with the said wire and fibrous
" material. I propose in carrying out my invention to braid or
" wind strips of india-rubber upon the wire, and then to apply
" the hemp or other such material and red lead."

[Printed, 8*d*. Drawing.]

A.D. 1866, August 14.—N° 2082.

NEWTON, ALFRED VINCENT.—(*A communication from James Bowden, Horace Theall, and William Henry Cobanks.*)—(*Provisional protection only.*)—This invention relates to an easy mode of fixing boiler tubes in their tube sheets, which is effected in such a manner that when required they may be easily removed.
" To this end two split taper ferrules are employed for fixing the
" tubes in the tube sheet; one of these taper ferrules slips on the
" tube to be fastened, and is provided with a screw thread at its
" outer end and a nut, while the other fills up the space between
" the edge of the hole in the tube sheet and the outer surface of
" the first ferrule in such a manner that by tightening the nut
" after the tube and the ferrules have been adjusted the inner
" ferrule is drawn up tight against the tube and the outer ferrule
" against the edge of the hole, and the tube is firmly secured in
" its place. By simply unscrewing the nut the tube can be
" readily released and removed from the tube sheet without
" sustaining any injury; the several joints are made tight by
" putty or packing."

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 15.—N° 2088. (* *)

WORTH, ROBERT JAMES. — (*Provisional protection only.*) —
" *Certain improvements in direct acting steam pumps.*"

"I place the pump or water cylinder in a straight line with
" the steam cylinder, and a little distance apart. The pistons for
" the steam and water cylinders are fastened to the same rod
" . . . Cast with or otherwise fastened to the steam cylinder
" is a circular valve chest in which works a piston valve . . .
" Cast with or otherwise fastened to the pump is another circular
" valve chest in which works a piston valve similar to the one
" employed in the steam cylinder, but in the pump the ports are
" broader than in the steam cylinder, and the faces of the valve
" are shorter than the ports . . . By preference these valves
" chests are in the same straight line, and both the valves fas-
" tened to the same rod, which is moved backwards and forwards
" by machinery connected with the piston rod or either or both
" of the pistons."

[Printed, *4d.* No Drawings.]

A.D. 1866, August 18.—N° 2127.

VARLEY, John.—This invention, relating to steam engines, consists, 1st, in several modifications for varying the traverse of the cut-off or expansion valves, which is effected by arrangements of levers with movable fulcrums, in connection with and operated by the governor. 2nd. Relates to an arrangement for working the exhaust valve from the cross head centre, the exhaust passage being open from the commencement of the stroke, until nearly its termination. 3rd. Consists in inclosing the body and ends of the steam cylinder and the steam valves, within a steam casing or jacket, in order to equalize expansion, and bring the valves close to their work. 4th. Relates to the use of gridiron valves, which are worked on their side, and slide longitudinally over the thoroughfares, thereby lessening the steam chambers; also in operating such valves by either a double or single cam, giving the valves two motions each way, respectively for applying the steam, and cutting it off, whereby the full area of the port is obtained; the speed of the cam shaft, by means of a pair of excentric wheels, being regulated as required; and the 5th part of the invention relates to casting or disposing the hot well, in which one or more thoroughfares are cast, on the top of the air-pump. The delivery valves are placed in the throughfares, which can be made to constitute steam cushions by placing these valves on the air-pump cover. An arm forged on the crank pin for actuating the air-pump, is applied as a simple arrangement to horizontal engines.

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1866, August 23.—N° 2161.

COFFEY, John Ambrose.—This invention, relating to self-acting steam and liquid safety gauges, is supplementary to a prior invention for similar gauges, for which Letters Patent, dated October 1st, 1852, No. 71, were granted to this inventor. The gauges formerly described, consisted of a glass tube connected with certain arrangements of cocks or taps, which tube when subjected to excessive pressure would break, and the balance of pressure on the valves of the gauge being thereby destroyed, the cock would immediately shut off the steam or liquid. The present invention provides the means for enabling the engineer, when the tube breaks, with personal safety to adjust the cocks or taps as required for closing the passage to the boiler, and thereby prevent the outflow of steam or liquid. This is effected by the use of a toothed segment having on its back a collar firmly fitted to the plug of the cock or tap. This toothed segment takes into another segment fixed upon a prolongation of the spindle of a "camb" or excentric valve, which is now used instead of the spindle valve formerly described.

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 24.—N° 2174.

FELL, John Barraclough.—This invention is applicable to locomotive engines and carriages. It is more particularly adaptable to railways with steep inclines, and may be used on ordinary gradients. It is supplementary to two prior Letters Patent, granted to this inventor and dated respectively 26th January 1863, No. 227, and 16th December 1863, No. 3182, which prior inventions relate to the use, on railways, of a central rail, intermediately laid between the two ordinary rails, and to the engine or carriages, in which are combined one or more pairs of vertical shafts, whereon, fixed upon their lower ends, are horizontal or "gripping wheels," which act in pairs, by pressure or otherwise, against the sides of the central rail. Where the driving wheels and gripping wheels have been driven by the same pair of cylinders, it has been found necessary to couple the axles of the gripping wheels. For this purpose toothed gearing has been used, but found to be objectionable.

The 1st part of the present invention dispenses with the use of toothed wheels, and substitutes friction wheels, or other wheels acting with teeth and friction combined; various arrangements are shown and described.

The 2nd part dispenses with crank pins and coupling rods under the gripping wheel axles.

The 3rd part relates to arranging the rocking shafts, which connect the gripping and carrying wheels. The shafts are placed on a level with and behind the cylinders, wholly or partly under the boiler, the arms descending from the rocking shafts being connected to the slide blocks of the piston rods, that transmit motion to the connecting rods which drive the gripping wheel axles.

The 4th part consists in a combined arrangement of engine and boiler, whereby the carrying axles are moved backward, so that the smoke box and cylinders shall so far overhang, as to give space to attach the connecting rods of the piston rods to the cranks upon the front gripping wheel axles, the rocking shafts being disposed behind and below the level of the cylinders, so that the arms ascend to the side blocks of the piston rods.

The 5th part relates to an arrangement of guiding wheels, which act upon the central rail.

The 6th consists in fixing the carrying axles, the wheels being free to turn thereon.

The 7th consists in mounting the brakes, intended to act directly upon the centre rail, upon framing or parts suspended from the carrying axles or boxes, or upon the framing used for the guiding wheels; and

The 8th relates to the so employing brakes to act upon the guiding wheels, that the pressure which forces a brake against its wheel, will react through the axle of the other wheel to force it against the central rail.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1866, August 24.—N° 2178.

BOOTH, JOHN.—This invention relates to metallic packing for pistons, consisting of a ring of metal, equal in breadth to two ordinary piston rings. This ring excepting in one place, is cut through round its circumference so as to form two rings of equal breadth, held together by the small portion of metal which remains uncut. Each section of the ring is then slantingly cross cut through, respectively from opposite sides of the uncut part, thereby giving freedom to the opposite end relatively of each ring. The sections of the ring thus held together are expanded, or a portion removed from each end and the ring compressed so as to give the necessary amount of reactive power in the cylinder, when the packing is placed in position upon the piston block. The expansion being equal on all sides consequently the friction is reduced, and as the ring is free to turn on the block, during the to and forth working of the piston, fluting, which is often caused by ordinary metallic piston packing, is prevented. Springs may be fitted to the respective free ends of the rings to add to their power of expansion.

[Printed, 6*d*. Drawing.]

A.D. 1866, August 25.—N° 2184.

GREEN, EDWARD.—This invention relates to improvements in gearing or apparatus employed for driving the scraper chains of "fuel economizers," used for the purpose of cleaning the soot and deposit from the flues and tubes of boilers and heating apparatus, the chains which work the scrapers being ordinarily passed over pulleys formed with a V groove. It consists—

1st. In the employment of one reversing motion to serve several scraper chain pulleys, such pulleys being driven by worm wheels and worms, or other gearing.

2nd. Obtaining a reciprocating motion by means of a double sliding clutch, actuated by a tumbler lever, and acting by turns upon two bevel pinions, geared into the opposite sides of a bevel spur wheel, which is fixed upon the worm shaft.

3rd. Altering the length of traverse by means of a screw and concentric slot.

4th. Fitting the worm wheels or driving gear loose upon the shafts of the V pulleys, and employing means for throwing any one, or more of them, out of action when required.

5th. While the driving clutches are getting into gear, stopping the action of the scraper chains, by causing the driving pins in the worm wheels, to traverse concentric slots formed in the V pulleys.

[Printed, 8d. Drawing.]

A.D. 1866, August 25.—N° 2189.

GAINSFORD, William Dunn.—(*Provisional protection only.*) —The object sought by this invention, which relates to railways and locomotive engines, is to effect greater adhesion between the driving wheels and the rails, for which purpose a projecting flange is formed on both sides of the wheels, inclined in such manner as to impinge upon each side of the head of the rails. The novelty of the invention consists in adapting this principle to curved lines of rails, in laying which, the head of the rail on one side of the curved line, is made "narrower than the head of the "rail on the other side; so that whilst the double flanged wheel "on one side of the engine is biting firmly on the broader rail "the narrower rail on the other side is not bitten by the other "wheel, but is entering freely between its flanges and is bearing "on the face of the tyre; the driving wheel on this side of the "engine is therefore free to slip on the rail, and no undue strain "is thrown on the axle; or in some cases I lay the railways in "the ordinary way both around curves and elsewhere, and I construct the locomotive engines for use thereon with double "flanged driving wheels so arranged that the driving wheel on "one side is able to turn independently of the one on the other "side. The driving wheels on the two sides of the engine may "be driven independently by separate steam cylinders."

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 25.—N° 2199.

PORTER, Charles Talbot.—(*Partly a communication from John Franklin Allen.*)—This invention relates first, to the construction of an equilibrium slide valve, and second to the means for diminishing loss of heat by conduction, (which heat passes from the cylinders of steam and other engines to the foundation on which such cylinders stand), by interposing between the surfaces, strips of mill board, papier maché, or other suitable non-heat-conducting substance. As regards the slide valves, they are especially adapted to that class of steam engines which are provided with separate valves for the induction and exhaust. The object sought to be attained, is the direct simultaneous admission of steam into one port through four passages, the valve sliding in equilibrio. The valve is in the form of an oblong frame, the face being parallel with the back; it slides free from steam pressure between the cylinder port surface and the under surface of a bridge, which rests upon shelves or projections on the port face, equal expansion and wearing of the parts being provided for. "On the face "of the bridge, in contact with the valve, a recess is formed of "the same length and width as and arranged opposite to the "steam port; the width of the valve and the opening therein "are so proportioned to the width of the port and the recess in "the bridge that when the end of the valve is brought to the "lower edge of the port the admission of steam to the said port "is completely cut off, but when the valve is moved towards the "opposite edge of the port four apertures are formed simul"taneously for the entrance of the steam, one on each of the "lower edges of the valve, two being on one face and two on the "other face thereof. The effective area of the port for the "admission of steam is increased till the side of the valve is in "the middle thereof, at which point all the four apertures are "open to an equal extent."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, August 27.—N° 2207.

FARMER, James.—(*Provisional protection only.*) — This invention relates to a mode of operating expansion cut-off valves for regulating the flow of steam into steam-engine cylinders. It is an adaptation of "L. B. Pitchers" hydraulic apparatus, patented October 2, 1851, No. 13,759, the regulating rod of which, through the aid of rods and levers, acts upon the throttle valve. According to the present invention, the regulating rod is made to act upon the expansion valves of steam engines, by means of another rod which is kept working to and fro by the engine, carrying a piece in which a slot is formed, which piece is capable of vibrating on a centre. Within the slot is a stud projecting from another rod, which is connected to the expansion valve, and also to the regulating rod of the hydraulic governor. The action of the regulator in relation to the speed, moves the stud up and down the slot, and so alters the action of the valve as to produce variable expansion. A modification consists in the use of a cam, so formed in two parts, that one part can revolve round the other on a common axis. Each part is provided with a projection, which acts respectively upon a roller carried by a lever, one to close the valve and the other to open it in connection with the action of the regulating rod of the hydraulic governor.

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 30.—N° 2239.

DAGLISH, Robert.—This invention, relating to steam boilers or generators, applies more particularly to those boilers which contain a combustion chamber, wherein, according to this invention, is to be fitted a group or number of vertical tubes, communicating at their lower ends with the water space beneath the combustion chamber, and at their upper ends with the water space above it, so that within the tubes, when the boiler is at work, there is a constant upward flow of the water. It is preferred "that the combustion chamber be situate at the rear end " of a cylindrical flue containing the furnace grate, and that the " products of combustion pass along a series of return tubes disposed above the main cylindrical flue and communicating with " a smoke box at the front of the boiler above the fire door. " The advantages obtained by the use of water tubes in the combustion chamber are increased heating surface and better circulation of the water, whilst as these tubes act as stays the " combustion chamber is considerably strengthened; provision is " made for removing the vertical tubes, and thus enabling any " repairs to be done to the horizontal tubes.

[Printed, 8*d*. Drawing.]

A.D. 1866, August 31.—N° 2248. (* *)

SCOTT, Henry George, and HALLOWELL, Nathan.—(*Provisional protection only.*)—" Improvements in valves for " pumps, said improvements being also applicable to steam " valves."

" Our invention consists in forming the bucket-clack or valve " of a spiral spring which may be composed of steel, iron, or " other suitable material .... The spring may be compressed " and the valve closed by shoulders on the valve spindle or by " other means."

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 4.—N° 2270.

WHITE, George.—(*A communication from Emile Sellier and Régis Fidèle Hermant.*)—This invention relates to a rotary steam engine, which comprises a fixed horizontal cylinder mounted upon a suitable frame, which is secured to the foundation. The ends of the cylinder are closed by covers, provided with stuffing boxes for receiving the main shaft which is concentrically passed through the cylinder, and carries on its extreme ends respectively, a fly wheel, and a pair of driving strap-pullies. Superposed mid-length upon the cylinder, is a steam chamber containing a slide valve, which by means of a handle outside, is made to uncover either one of two ports, which admit steam through external pipes, respectively leading from the steam box into opposite sides of the cylinder about level with its axis. Inside the cylinder the shaft is furnished with eight radiating blades, the superficial size of which is regulated to clear the internal circumferential surface of the cylinder, and move round without friction between the end covers. The blades radiate in straight lines, and the steam is admitted at a suitable angle by the steam pipes for striking upon them at right angles to their surface, on one side or the other, from either the one or the other pipe, according to the desired direction of motion. The impulsive force of the steam against the blades as they revolve with the axis and in succession come round, keeps up the rotary motion, which is transmitted from the main axis by means of the strap pulleys.

[Printed, 8*d*. Drawing.]

A.D. 1866, September 6.—N° 2288.

CUTHBERT, William.—This invention relates to steam whistles, and "consists in carrying through the crown of the bell " and through the tongue a rod, the lower end of which carries " a valve which is kept raised either by a spring or by the pressure " of the steam; the upper end of the rod extends a short distance " above the crown of the bell, and a lever which is hinged to a " projection attached to the nut on the crown or otherwise bears " upon the top of the rod. When it is required to sound the " whistle this lever is pressed down by hand or otherwise, so as " to force down the rod and thereby open the valve; the steam " is thus allowed to escape through the ordinary apertures and " sound the whistle."

A double-toned whistle is constructed as follows:—Employed between the tongue and the bell is a cylinder, equal in diameter with the mouth of the bell, and connected to the central support of the bell and tongue by a bridge or arms. By means of a spring, the bell is maintained about a quarter of an inch more or less above the cylinder. When a shrill whistle is required, the valve rod is pressed down by the lever, but when a fog or guard signal is required a second lever presses down the valve rod and also forces the bell down upon the cylinder, so as to close the space between them. The whistle will then emit a dull sound. This whistle may be sounded by the engine driver at his place on the foot plate, by hand, or from a distance by means of a communicating wire.

[Printed, 8*d.* Drawing.]

A.D. 1866, September 7.—N° 2296.

ABEL, Charles Denton.—(*A communication from William Bowman Robinson and Zoheth Sherman Durfee.*)—This invention relates to relieving the slide valves of steam engines of back pressure, by the use of packing rings, which effect more perfect steam-tight contact between the valve and under-side of the valve box, and allow the valve to rise in case circumstances require it. Several modifications are described. The first consists in forming an annular projection upon the back of the valve, sufficiently high to reach nearly to the inner face of the valve box cover. An annular groove or rebate is sunk into the edge of this projection to receive two packing rings, which are so formed, that when pressed upwards from underneath by springs and by the steam (which is admitted through holes pierced from the outside leading into the annular groove underneath them) the rings, which are cross cut at one or more points, or formed into segments, contract round the inner surface of the groove, and are simultaneously so pressed against the valve cover, as to render the contact steam-tight, the area of the face of the valve being somewhat larger than the area enclosed by the packing rings at the back, where there is an opening to the atmosphere through the valve box cover.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, September 7.—N° 2302.

KITCHEN, Johnson, KITCHEN, William, and SAMUELS, Samuel.—(*Provisional protection only.*)—This invention relates to a system of railway brakes which are actuated by the direct action of steam, and are solely under the control and management of the engineer. A steam cylinder conveniently placed on the "tender" is employed, the piston rod by means of connecting bars or rods being in direct communication with the carriage brakes. "Each carriage is provided with a bar or rod that ex-" tends the whole length of the carriage; the extremities of "these rods are provided with 'buffers' that are capable of being "adjusted in such a manner that the rods to which they are con-" nected can by means of springs or screws be extended or con-" structed so as to cause the bars of each carriage when the train "is 'coupled up' to be in close contact with each other, forming "thereby one continuous connection or unbroken line from end "to end of the train. These bars are supported in bearings "secured to the body of the carriage, and are provided with a "lever in connection with a cross bar connected by rods with the "'break blocks.' Thus when it is desired to apply the 'break' "the engineer turns steam into the break cylinder, which either "gradually or suddenly applies the break to the wheels through-" out the whole train. The lever by which steam is turned on "into the 'break cylinders' is arranged so that it can be con-" nected or disconnected with the ordinary handle for turning on "steam into the locomotive cylinder, which is thus arranged to "enable the engineer in case of emergency to turn the steam on "into the break cylinder with the same action that shuts the "steam off from the cylinder of the locomotive."

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 10.—N° 2317.

FRANKLAND, William.—(*Provisional protection only.*)—This invention, relating to apparatus for lubricating those internal frictional parts of steam engines to which steam has access, consists "of a ram or force pump which forces tallow into the steam "pipe or steam chest at each stroke of the engine, the quantity "of tallow forced into the steam being increased, or diminished, "or totally shut off at the option of the engineer by means of a "steam-tight tap which regulates the supply of tallow, and an "overflow valve which disposes of that portion of the tallow "which has been received into the ram chamber, but not forced "into the steam. At each stroke of the engine the ram receives "a *uniform* supply of tallow through a clack or valve from a

" tallow cistern in which the ram chamber is placed. Part of this " tallow is forced into the steam in proportion as the steam-tight " tap placed between the ram chamber and the steam pipe or " steam chest is more or less open, and the remainder is forced " back again into the tallow cistern through the overflow valve, " the pressure on which per square inch greatly exceeds that of " the steam in the boiler." The return of the surplus tallow, by mechanical means, from the ram chamber to the tallow cistern, constitutes the invention.

[Printed, 4*d.* No Drawings.]

A.D. 1866, September 10.—N° 2330. (* *)

BENNETT, Robert.—(*Provisional protection only.*) — " New " or improved modes of obtaining and transmitting motive- " power and in the machinery or apparatus employed therefor."

" The essential feature of this my invention consists in alter- " nately increasing and diminishing the area of the piston and " cylinder or pistons and cylinders, or acting surfaces at the ends " of their strokes (or at the time the crank is turning the other two " 'dead' centres in a line with the axis of the moving piston or " cylinder), so as to act upon and move the actuating surface, for " the time being, with a proportionately greater force in the direc- " tion of motion than in the reverse direction equal to the said " difference made or caused in the area of the actuating surfaces, " and the pressure of steam acting thereon above that of the " atmosphere, and by this means keeps the direct pressure of the " steam or other fluid power employed constantly acting within " the cylinder or cylinders, as the case may be, without any " great or essential escape of the acting fluid or heat there- " from." Although this engine is described in the form necessary for use where steam is employed as the motor, yet the invention also includes the employment of water or other fluid.

[Printed, 4*d.* No Drawings.]

A.D. 1866, September 11.—N° 2332.

BALDWIN, Thomas.—This invention relates to safety valves, and to the construction of steam boilers. As regards the former, the object is to construct small valves to deliver as much steam as large valves of the ordinary construction. The valve is spherical, and may either be weighted inside the boiler, by suspending a weight direct from the valve, or an ordinary lever and weight may be employed to press externally upon the valve. The peculiarity consists in the concave annular seating which is formed to the zone of a larger sphere than the valve, so that the valve when closed merely rests on the inner edge of the central passage, leaving space between, which divergently increases towards the outer edge of the seating, but which when the valve is partly open becomes equal all round, and decreases when the valve is fully open, so that the steam then acts from the inside as a wedge. As regards boilers, the invention consists in uniting the plates by single and double rivetted joints; the object being an increase of strength over boilers constructed in the ordinary manner with plates of the same thickness; all the longitudinal joints being united by a double row of rivets, and the circumferential joints by a single row.

[Printed, 8*d*. Drawing.]

A.D. 1866, September 11.—N° 2334.

PAGET, Frederick Arthur.—(*Provisional protection only.*)—This invention relates to the construction of screw bolts and rivets for connecting those parts of machinery and other structures which are liable to impulsive forces; ordinary bolts, whilst resisting such forces, being subject to fracture at the screwed end, which in consequence of the thread being cut out of the solid metal is the weakest part. This danger (as stated by the inventor) is obviated "by causing the impulsive force to act through a certain distance, which I effect by so proportioning the connecting "part or parts, and (or) by so adapting certain contrivances "described in the Letters Patent granted to me on the 29th May, "A.D. 1865, that such connecting part or parts can stretch and "(or) yield in the direction of the impulsive strain or strains; "by this greater extension, according to known principles, less "substance is required in the given connecting part to resist "distortion and rupture."

In order to equalize the longitudinal strength of the bolt through its whole length, the shank (by preference of steel) is made hollow, and the head and threaded part solid of the same metal. These bolts are used with one or more steel cup-washers, *described in the* aforesaid Specification, which washers "not

" merely lock the nut of the bolt on which they are placed and " equalize the strain on the threads, but also completely protect " the connecting parts of machinery and structures liable to " impulsive forces." The invention may be advantageously employed in connecting those parts of steam hammers which have to resist the impulsive force brought into action at each blow, and (as a further example) may be applied to the coupling bolts of steam engine connecting rods, which have to resist during the inward stroke, the whole effective power of the engine.

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 11.—N° 2339. (* *)

BOUSFIELD, George Tomlinson.—(*A communication from Jean Baptiste Thierry, junior.*)—(*Provisional protection only.*)— " Improvements in apparatus applicable to marine steam " boilers."

Jets of superheated steam are blown on the fire through nozzles supplied with steam from a box of malleable cast-iron fitted over the fire-door of the furnace. The steam is first superheated in an apparatus placed in the up-take, and is then further heated by conveying it through pipes in the furnace into the blowing apparatus, which is itself heated *in situ* over the fire door.

[Printed, 8*d*. Drawing.]

A.D. 1866, September 14.—N° 2366.

OLDHAM, Alexander.—(*Provisional protection only.*)—This invention, relating to the metallic packing of pistons, consists in the external and internal formation respectively of the inner and outer packing rings. The ordinary spiral expanding ring is employed, the periphery of which is bevelled " from the centre of " depth inwards towards the top and bottom, and afterwards," is removed or turned out, " a right angular recess round the top " and bottom of the ring. The inner surface of the packing " ring (which is a double ring cut across diagonally) is formed " exactly in the reverse of this configuration, so as to correspond " when fitted into each other with the periphery of the expanding " spiral ring, the requisite compression of the whole being effected " by the piston cover, which is either screwed down by screws, or " may be screwed round the piston rod, on which a thread is " formed for the purpose." The " stop pieces " usually employed with segmental packing rings are dispensed with, and the depth of the piston increased.

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 15.—N° 2377.

VON RATHEN, ANTHONY BERNHARD, BARON.—This invention relates to an apparatus wherein steam, compressed air, or other motive agent, is to be employed for producing rotary motion. It consists of a fixed cylindrical chamber, provided at top with passages for the admission of the steam or motive agent, and its emission when the movement of the apparatus is required to cease. Mounted upon a central axis within the cylinder, is what is denominated the "power wheel." This wheel does not fill the internal space, an annular cavity being formed around it, and it is free to revolve without contact with the ends of the cylinder. No piston, valves, or slides are employed. On the opposite sides of the power wheel, bounded by a diametral line drawn through its centre, portions of the wheel are removed, forming cavities, the bottoms of which, when furnished, are at right angles with the diametral line. The furniture consists of a triangular piece in each cavity, which rest respectively upon right angular blocks near the axis, and each supports a box piece, which forms the bottom of that portion of each cavity which is left permanently open on the opposite sides of the wheel. The narrow space between the sides of the cavity and the metal furniture is made air-tight, and it is said, the fluid pressure upon one box piece, is balanced by the fluid pressure upon the other. When the motive fluid is admitted it fills the space which surrounds the power wheel, and by its constant pressure upon the diametral surface of each cavity, it is stated, the wheel is caused to rotate, and will continue to do so until the emission passage is opened and the fluid discharged. There is to be no exhaust whilst working. The axle bearings are suitably packed, and modifications of the constructive details are described ; also prior Letters Patent granted to this inventor, bearing date March 23, 1865, No. 818, are referred to.

[Printed, 3*s*. 10*d*. Drawings.]

A.D. 1866, September 15.—N° 2378.

TWIBILL, JOSEPH.—This invention relates to apparatus which *may be applied* to steam generators, boilers and water heaters in general use, and also to the boilers described by this inventor in the Specificification of former letters patent, dated January 27, 1865, No. 243. The present invention consists :—

1st. In the construction and use of supplementary heating apparatus, comprising a group or groups of tubes, set in rows into transverse pipes or end casings, which so communicate with the water spaces of the boiler, that the water of the boiler circulates freely through the tubes and parts which constitute the heating apparatus. Sometimes the heaters comprise closed vessels or cylinders containing tubes, through which the products of combustion pass, whilst the water from the boiler circulates within the vessel amongst the tubes. These heaters are disposed in the internal flues and combustion chambers in and about boilers, directly in the course of the heated gases and products of combustion, and in some cases are built in the brick flues.

2nd. Relates to scraping the external surface of steam boiler and heater tubes by apparatus which, by means of chains actuated by suitable mechanical appliances, is made to operate simultaneously upon all the tubes in a row or section, the scrapers being fashioned to the required form.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, September 17.—N° 2387. (* *)

M^cDOWELL, Daniel.—" Improved apparatus for cleaning the " tubes of steam boilers."

It is of that class in which a jet of steam is used. Instead of carrying the steam to the blowing nozzle by means of an india-rubber pipe, a metallic pipe is used, carried by a bracket fixed on the boiler or smoke box. It is made in several lengths connected by screwed sockets; gas pipes connected by the ordinary screwed elbow joints allow any movement, as the turning of the screwed ends of the pipes in the sockets makes them act as universal joints. The piping has a stop-cock at its connection with the steam chest and also at the nozzle. The nozzle " may be used " either in the smoke box or the fire-box, a small auxiliary open " ing furnished with a sliding or other door being provided in " the ordinary door;" so that it can be employed whilst the furnace is at work.

[Printed, 8*d.* Drawing.]

A.D. 1866, September 17.—N° 2388.

BOUSFIELD, George Tomlinson.—(*A communication from David Meeker Nichols.*)—The object of this invention, which relates to the application of steam jets to hasten the draught in steam boiler flues, is "to obviate the loss of useful effect due to " the arrangement of a steam jet in a flue of suitable size for " natural draught, and at the same time to enable such a flue to " be retained so that the natural draught may be used in starting " the fire or at other times as found convenient, and yet the " steam jet can be used when required with the best effect; it is " also designed to obviate the loss of useful effect due to the " round form of the jets of steam."

1st. " The invention consists of the combination of a series of " steam nozzles with a flue divided into two divisons (one of the " proper area from the rapid current of air produced by the steam " jet and the other of larger area,) and with a valve or valves, " by means of which the larger division may be closed or opened, " hence the entire area of the larger flue may be used (by opening " the valve) for the natural draught, or by closing the valve the " area in the vicinity of the steam jet may be reduced to the " proper dimensions to enable the jets of steam to operate to " the best effect upon the air by being set so close together " that their effect is concentrated upon the air in the flue, and " that the formation of eddys between the direct currents is " prevented."

2nd. It " consists of a steam jet composed of a series of " nozzles having orifices of square or other equivalent form, so " that the jets of steam delivered by them when meeting will " leave no spaces between them, or, in other words, having " orifices of such form that their transverse sections when " placed side by side will cover up a plane surface. The form " that has been employed with success for this purpose is the " square, but it is evident that a triangular or hexagonal form " (if the nozzles be properly arranged) will operate substantially " in the same manner, because a plane surface may be completely " covered with equal triangles or hexagons in the same manner as " it may be with squares."

[Printed, 8*d*. Drawing.]

A.D. 1866, September 19.—N° 2405.

BARLOW, ELIAS, and DACK, WILLIAM NATHAN.—(*Provisional protection only.*)—This invention relates to all that description of steam engine constructed to work with high and low-pressure steam, or to a single cylinder using at one end high-pressure steam, which is exhausted thence into the other end, the object being to relieve the high pressure side of the piston from the back pressure at the commencement of the return stroke. This is effected by "removing and discharging the back pressure "steam remaining after the partial exhaust has been effected "from the high-pressure cylinder direct into the condenser or "into the atmosphere, which object may be accomplished by "passing the high-pressure steam for the first exhaust into a "receiver until the pressure therein equals that in the high-"pressure cylinder, at which time the communication between "them is closed by any suitable description of cock or valve, "and another valve is opened which communicates direct with "the condenser, into which the remainder of the steam passes "and leaves the ends of the cylinder perfectly exhausted of its "steam, offering no resistance to the piston; the valves may be "actuated by cams, eccentrics, or cranks."

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 19.—N° 2407.

GEDGE, WILLIAM EDWARD.—(*A communication from Emilio Musciacco.*)—(*Provisional protection only.*)—This invention relates to a pneumatic steam dredging apparatus, which consists of a floating vessel, the hold of which contains a covered space or hopper, which is hermetically closed, a short pipe closed by a tap being inserted in the upper part (which answers for a deck) for the emission of the air contained, and for the purpose of ascertaining the pressure when steam is admitted to fill the hopper. The upper ends of suction dredges or pipes, which reach nearly to the bottom of the water or river, are bent so as to enter the upper sides of the hopper vessel, whereto they are secured and made air tight by suitable packings. The lower ends of the suction pipes are attached, by means of strong canvass, to hollow cases, which take the form of truncated pyramids, open at bottom, and resting upon the bed or bottom of the river or water. Projecting from the poop of a steam boat, which attends upon the dredger, and supplies steam thereto through pipes with suitable union joints which allow liberty to turn in any required direction, are two beams, to which by means of chains the upper ends of the suction tubes are left suspended when detached from the sides of the hopper vessel. When the steam is turned on to fill the hopper, after the air is expelled, and steam issues from the air tube, the small air cock is closed. In a few instants condensation of the steam takes place, and a vacuum is formed in the hopper. The weight of the atmosphere causes a rush of water up the tubes and into the hopper, the water carrying up all the mud and sand within and about the open truncated mouths of the tubes, and also portions of gravel from the river bed, whereby the cleansing and deepening of the bottom of the river or water is effected. When full, the hopper boat casts off the suction pipes, and proceeds to a convenient spot, where by opening a sluice valve at the bottom of the hopper the dredgings are deposited. Instead of employing the steam boat, the hopper boat may contain the boilers, and generate the requisite quantity of steam for carrying on the operation.

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 19.—N° 2408.

DIXON, THOMAS.—This invention consists in so applying a "Jukes'" furnace, comprising an endless chain or belt of travelling grate bars, that the flaming gases and products of combustion go direct into the flues of a Cornish boiler, in front of which the furnace is built of brickwork containing air channels or passages for heating the air admitted to promote combustion in the furnace. The external entrance to these channels is over the furnace, which is covered by two arches, one built a short distance above the other, forming between them a thin space or channel, which extends down between the brickwork of the sides of the furnace, and communicates through lateral openings with the ash-pit, which is otherwise closed by a door at the front. The air draught, entering above the furnace in quantity regulated by a damper, is heated in the passages, and in that state passes through the ash-pit to the fuel. A small auxiliary boiler in connection with the main boiler may be superposed over the furnace, and the air channels may be arranged in the side brickwork, or a furnace closure, similar in construction to a locomotive fire-box, is sometimes employed. When the furnace is brick-built, the brickwork is set in a frame movable on rollers for permitting expansion or contraction of the parts.

[Printed, 1s. 4d. Drawings.]

A.D. 1866, September 20.—N° 2415.

BÉRARD, Aristide Balthazard.—The object of this invention, which relates to the process and apparatus employed for manufacturing steel from cast iron, consists, 1st, in the purification of cast iron, by eliminating from it as completely as possible, and with the least possible waste, the foreign bodies it contains, and which if left injure the quality of its products; and, 2nd, in the decarburation of the cast iron by a process suitable for its conversion into steel.

"The improved process is founded on the employment of gases
" as the agents for the production of heat, and as reagents on the
" liquid cast iron. The principle on which the reactions take
" place is by effecting a series of successive oxydations and re-
" ductions; the chief agents employed are air, water, steam, and
" reducing gases (such as hydrogen, carbonated hydrogen, and
" oxyde of carbon), and by putting carbon in contact with the
" metal by way of cementation."

The apparatus employed for the production, extraction, and washing of the gases, consists of a kind of blast furnace, closed at all points, made of cast or sheet iron, and lined with refractory brick. "Smiths' coal" is (by preference) the fuel employed, but dry wood or peat may be used. The fire-bars are made hollow, and admit the air necessary to support combustion. Steam, superheated in pipes built in the brickwork, is introduced into the furnace and decomposed, producing oxide of carbon and hydrogen.

"The carbon of the cast iron which is burnt under the action
" of the oxydizing current is restored in a certain proportion by
" means of the carbonaceous brasque of the sole plate by way of
" cementation, by contact, and also by oxyde of carbon producing
" the bubbling; I can also at the same time project charcoal
" powder. If the carbon were not restored in a certain propor-
" tion to the cast iron the latter would pass too rapidly into the
" state of steel or iron before time would admit of expelling

" injurious foreign matters if they are in too large a quantity. " The reduction as well as the oxidation facilitates the elimination of the metalloids in combination, for hydrogen forms " equally with sulphur and phosphorous gaseous compounds, " which escape by volatilization; but phosphorous is specially " absorbed by the scoriae in its intimate contact with the metal " to which it passes in a state of phosphate of iron. The iron " oxyde in a nascent state is promptly brought back to the " metallic state under the action of the oxyde of carbon and " hydrogen, and re-enters into solution in the bath by which the " waste is lessened. The action of the hydrogen tends also to " neutralize the hurtful effects of the cementation of the oxygen " in the iron, which is rapid at a high temperature, producing " what is termed burnt iron, which is a product of which it is " well to avoid the formation. By this series of oxydations and " reductions, repeated as long as required by the degree of impurity of the cast iron to be treated, I succeed in purifying cast " iron the most contaminated with hurtful bodies."

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1866, September 25.—N° 2458.

TURNER, HENRY.—This invention, relating to furnaces and apparatus for consuming smoke and economizing fuel, " consists " of a series of retorts into which the fuel is charged through a " closed hopper; the retorts are heated by a fire placed underneath, and the fuel is forced out of the retorts on to a plate, " and thence on to the grate or grates, which consist of one or " more plates having diamond or other shaped slots; these grates " when required are turned partly round to discharge the clinkers " and cinders into the ash-pit; the combustible gases from the " retorts pass over the incandescent fuel on the grate or grates, " and are thus consumed before passing into the flues. The products of combustion from the fire under the retorts may be " taken at first over the main fire-grate, and afterwards into a " flue or flues passing through the boiler to superheat the " steam."

[Printed, 10*d*. Drawing.]

AD 1866, September 25.—N° 2466.

NEWTON, ALFRED VINCENT.—(*A communication from John Benjamin Root.*)—This invention, relating to steam engines, is in part applicable to pumps and other apparatus employing pistons and plungers. The objects to be attained are—

1st. The prevention of lateral wear in and against the sides of the cylinder and stuffing boxes of trunk engines, caused by the oblique or indirect pull and thrust upon the connecting rod, to obviate which the trunk is extended through "a stuffing box or " its equivalent in the end or head of the cylinder furthest from " the crank to more than an ordinary distance, and providing " such extended portion of the trunk outside of or beyond the " end of the cylinder with a fixed guide or guides parallel to the " cylinder in combination with establishing the attachment of " the connecting rod with the trunk and piston at such a point " that it works within or between the guides throughout the entire " stroke or thereabouts, thereby not only obtaining a long connecting " rod to the reduction of its angle with the line of the " cylinder at and near half stroke, and consequent reduction of " lateral pressure, but bringing the maximum of such remaining " pressure upon the guide or guides instead of upon the sides of " the cylinder, such construction also affording greater convenience " for oiling and tightening up the connecting rod attachment."

2nd. Relates to a similar class of engine, and "consists in " constructing the guide or guides outside of or beyond the end " or ends of the engine cylinder of a close or cylindrical form, " and arranging the packing or packings which prevent leakage " at the trunk on or in the trunk itself, and so as to move with " the latter within the guide or guides, whereby the packing " rings are made to form the slides within the guides, and whereby " for a limited length of trunk longer cylindrical guides may " be used, and the engine made shorter for a given length of " stroke and guide, also the construction of the packing simplified " by dispensing with stuffing boxes, glands, and bolts in " the ends of the guides."

3rd. "Relates to a peculiar mode of hanging and driving or " operating the valve which admits and exhaust steam from an " engine. This improvement is applicable not only to trunk but " other engines and to most or all descriptions of valves, whether " conical or otherwise, the faces of which travel in the arc of a " circle, and it consists in working the valve by a rock shaft that " has projecting from it a radial pin cylindrical at its extremity, " which fitting a cavity in the valve serves to drive the latter and " *to allow of its self*-adjustment to preserve a tight contact with

" its seat irrespective of the equal or unequal wear of the rock " shaft in its bearings."

4th. Relates to that description of metallic packing for pistons and plungers which is kept tight by the pressure of the steam or fluid by which the piston or plunger is driven, or which they are employed to move,

[Printed, 1*s*. Drawing.]

A.D. 1866, September 25.—N° 2469.

LAKE, William Robert.—(*A communication from Oscar Theodore Earle.*)—The object sought by this invention is the production of a steam pump which by the admission of steam to the cylinder shall be self-starting at any part of the stroke without the aid of starting levers, cranks, fly wheels, or any of the ordinary appliances; the ports in the water cylinder are free, the valves easily accessible, and the course of the water direct. Metallic valves with flexible packing rings fitted into recesses in their acting surfaces are employed.

The steam cylinder is horizontally placed in a rectilineal position with the pump cylinder, so that the two pistons are fixed on the respective ends of one piston rod which works to and forth through suitable stuffing boxes fitted on the contiguous ends of the cylinders. The cylindrical steam valve rod is worked by a tappet arm fixed upon the piston rod betwixt the cylinders. The exhaust steam from the cylinder completes the action of the valve, which is prevented from striking the end of the valve case by the formation therein of a steam cushion. The pump valve chest is mounted upon the pump cylinder, and is furnished with four valves, a suction and a discharge valve for each reciprocated action of the pump, and superposed upon the valve chest is an air chamber.

[Printed, 8*d*. Drawing.]

A.D. 1866, September 29.—N° 2515.

JOY, David.—(*Provisional protection only.*)—This invention relates to applying the power of combined high and low-pressure engines, the respective speeds of their pistons being regulated in relation to the high and low pressure of the steam by which they are actuated, a normal speed being afterwards produced by suitable gearing; or a screw propeller may be driven by the speed of the high-pressure piston, and paddle wheels by the low-pressure piston, or two screws of different pitch, or paddle wheels of different diameters; or the length of stroke of the high and low-pressure pistons is proportioned in relation to the pressure, the steam being worked expansively in either of the cylinders, or in both combined. The arrangement as regards condensers and air pumps, in connection with the low-pressure cylinder is of the ordinary description; the high-pressure cylinder being also added to low-pressure cylinder engines, and so arranged that the exhaust high-pressure steam may either be conveyed to the low-pressure cylinder for conjoint working, or to the chimney when the high-pressure cylinder is thrown out of gear and independently employed. Land engines are combined in a similar manner, and for locomotives, pairs of driving wheels of diameters proportioned to the relative speeds of the high and low-pressure pistons are employed. Cylindrical balance valves, which are constantly forced in one direction by the steam pressure, are fitted to these engines.

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 3.—N° 2539.

SWANN, John Russell.—This invention relates to safety valves, which are so arranged, "that an undue weight applyed "to the lever of the valve in place of allowing an increase of "pressure in the boiler will cause the steam to blow off at any "pressure to which the apparatus may be set. In place of "arranging the valve lever to turn on a fixed centre or axis, as is "usual, I arrange the centre or axis in such manner that it is "kept down only by a spring or weight which yields when undue "pressure is applied at the other end of the lever; the outer arm "of the lever then descends a short distance till it comes against "a fulcrum arranged for it between the valve and the weight, "and then the undue weight applied to the lever aids in taking "pressure from the valve. The inner end of the lever with its "centre or axis is cased in, so that it cannot be tampered with. "The same arrangement is applicable where an adjustable spring "is applied to the outer end of the valve rod in place of a sliding "weight."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, October 3.—N° 2546.

FISHER, HENRY.—(*Provisional protection only.*)—This invention relates to steam boilers and boiler furnaces. As applied to an oblong boiler, it is described as follows :—" The platform on " which the fuel rests may be of any suitable construction; the " bridge or check piece at the back of the furnace or fuel " chamber may be of brick, or a water space opening into the " sides of the boiler; this check piece is carried up from the fuel " platform to the top of the fuel chamber, there being formed " through it one or more openings for the admission of air to " the solid fuel on the platform, and which air passages are " connected with an air chamber formed between the check piece " and a waterspace about the height of the fuel chamber, and in " the rear of the check piece, and the said air chamber is continued to and into the ash-pit, or elsewhere. The top or crown " of the fuel chamber is a brick arch, tiles, or horizontal or " arched water space opening into the sides of the boiler, . . . " and extends from the top of the . . check piece . . to a " given distance . . about two-thirds over the fuel, so as to " leave between the said arch and " a projection formed over the mouth of the furnace, " a sufficient space or uptake . . . to " allow the gases to pass out of the fuel chamber upwards into " the gas chamber, which is formed immediately over the arch. " . . . The gases are then conveyed into a chamber at the " rear of the water space " which forms " one side of the air " chamber at the back of the furnace, and thence forward in any " required course. Where no ash-pit is used, the air chamber at " the back of the back of the bridge or check piece opens out " below, or at the side of the boiler, and is supplied with air " through a suitable passage."

Sometimes the gas chamber is dispensed with, in which case the gas in the fuel chamber is then brought near to the front, and returned through a gas chamber on one or both sides of the furnace level with the fuel chamber, and continued to the rear of the furnace or boiler, according as the gas chamber may be carried in or outside the boiler. Further modifications are described.

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 5.—N° 2566.

CHAPMAN, John Cole.—This invention, relating to steam engines, is partly applicable as a mode for fixing excentrics, cams, and pulleys, on shafts. It is designed as a substitute for the link motion, which is dispensed with, the reversal of the engine being effected by altering the relative position of the excentrics on the crank shaft, whilst the engine is either running or stationary, without interfering with the expansive working of the steam. The excentrics are made in the form of rings, which internally are considerably larger than the crank shaft to which they are connected in the following manner. "To each crank " on the inner side (or that next the excentrics) is bolted a " circular plate or disc, and each excentric ring has fixed to it " (and projecting at right angles from its inner face) a twisted " cam plate or scroll, the ends of the said cam plates being " pivoted into holes in the circular plates or discs above men- " tioned. These two twisted cam plates or scrolls (being thus " carried between the two discs and themselves carrying the " excentric rings) pass through openings in a collar or clip which " is mounted on the crank shaft between the two excentrics and " is capable of sliding longitudinally on the said shaft, but is at " the same time caused to revolve therewith by means of the " twisted cam plates, which act as keys or feathers. . . When " the collar or clip is exactly midway between the two excentrics " the latter will be concentric with the crank shaft, and the " further that it is removed from this point in either direction " the greater will be the throw of the excentrics, and con- " sequently the steam may be worked to any desired amount " of expansion." Modified arrangements are shown and described.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, October 6.—N° 2574.

DEACON, Simeon.—This invention consists in so adapting a combined steam chest and valve to the cylinders of oscillating steam engines, that the steam passages through the trunnions of the cylinder are dispensed with. This object is accomplished in the following manner. "There is a raised face near each end of " the cylinders with a steam port formed in the centre of each. " The steam chest is a fixed hollow box with a partition therein,

" so that one half of the said chest communicates with the
" exhaust, and the other half with the steam pipe leading from the
" boiler; the said chest is formed with steam and exhaust ports
" at top and bottom of the faces of the said chest corresponding
" with the ports in the before-mentioned raised faces upon the
" cylinder. One of the trunions of the cylinder passes through
" the said steam chest, so that as the cylinder oscillates the ports
" in the faces thereof will be brought opposite to the steam or
" the exhaust ports in the steam chest, according to the position
" of the piston in the cylinder, that is to say, suppose the piston
" to be at the bottom of the cylinder the steam port at the top of
" the cylinder will be opposite to the exhaust port in the steam
" chest, and vicê versâ when the piston is at the top of the
" cylinder. And for varying the cutting off of the steam I
" propose to employ a loose plate placed between the cylinder
" and the steam chest, which may be worked by an excentric or
" other suitable means. The faces of the steam chest and
" cylinder may be kept in close contact by set screws passed
" through the framing of the engine."

[Printed, 10*d*. Drawing.]

A.D. 1866, October 8.—N° 2586.

ROBERTSON, James.—The object of this invention, which relates to furnaces or fire-places, and to fire-bars, is to effect the consumption of the smoke and inflammable gaseous products of combustion. Immediately behind the furnace bridge there is a chamber, leading into which, there is an open passage beneath the bridge through the back wall of the ash-pit. This chamber is covered by a metal or fire-brick slab, which is level with the bottom of the flue, and is perforated to receive the lower ends of a number of vertical tubes, which are interposed in the flue space, and rise towards the bottom of the boiler. The upper ends of the tubes are closed, and the sides are perforated. Their position being in the direct course of the fire draught, they in consequence become highly heated, and impart heat to the currents of air, which passing from the ash-pit up through the chamber, issue in jets or divided currents, from the perforations in the tubes, amongst the burning products of combustion, causing the inflammation of the gaseous constituents, and the consumption of the smoke.

It is proposed, that the fire-bars employed be made hollow or *trough-like* from end to end, and of malleable or cast iron, to receive bars of fire-clay, which rest in the hollow of the furnace bars and form the grate surface.

[Printed, 8d. Drawing.]

A.D. 1866, October 8.—N° 2591.

NEWTON, William Edward. — (*A communication from Alexandre Damas Marye.*) — This invention relates to steam engines, constructed with high and low pressure cylinders which work with conjoint action. These cylinders are placed concentrically one within the other; the small cylinder which receives steam direct from the boiler, exhausts into an annular space or jacket by which it is surrounded, and thence the steam flows in to the large cylinder, the piston packing of which is disposed in a recess formed round the bottom end of a cylindrical cap or trunk, which fits and slides over the small cylinder. This trunk is closed at top, and bored to the size of the piston rod, on which it is fixed. The trunk piston during the upward stroke, is received into a bell-shaped chamber, which is superposed on the large cylinder, and surrounded with a steam jacket. The small piston is fixed upon the lower end of the same piston rod, the upper end, passing upwards through a stuffing box at the top of the bell-shaped chamber, carries a crosshead and slide, which vertically works in a suitable guide. From the ends of the crosshead depend two connecting rods, the lower ends of which are jointed to the ends of another crosshead centrally carrying a short rod, which is coupled to the crank below.

[Printed, 10d. Drawing.]

A.D. 1866, October 9.—N° 2608.

DUDGEON, William.—This invention relates to the construction of ships adapted to propulsion by twin screws, and to steam engines for driving them. As regards ships, the object sought is to provide support for the two screw shafts, which project astern in parallel lines with the keel, from under the ships quarters, and which respectively are encased and carry the screws. For this purpose a flat horizontal chamber is constructed on each side and fixed to the skin of the vessel, projecting laterally therefrom so as to enclose and support the screw shafts; and inside the vessel, extending from side to side, is fixed a horizontal plate framing to correspond with the level of the shafts, so as to form a substantial lateral support between the chambers, which are rendered more firm by a transverse vertical bulk head. The extreme ends of the chambers, wherein the shaft bearings and stuffing boxes are fitted, are further supported by wrought iron diagonal stays or brackets, which are fixed to the sides of the vessel by rivetting through the skin and ribs. The steam engine cylinders are superposed at suitable angles on a central box framing, which also serves as a condensing chamber. The top of this chamber rises to a flat ridge over the line of the keel, and slopes downwards on each side, so as to direct the piston rods in a line with the centre of the crank shafts, which are coupled to the screw shafts in the ordinary manner. The air pump and hot well occupy a portion of the space between the cylinders, and the side framings which support the crank shafts, are attached to the central chamber.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, October 11.—N° 2625.

WILSON, EDWARD BROWN.—This invention, relating to the furnaces of marine and stationary boilers, is applicable to puddling and other similar furnaces; it is described as follows:—" When
" altering a marine or similar boiler I insert a water space, or,
" if preferred, a brick arch at the top of the furnace, some distance
" within the boiler; I remove the bars, introduce a cast-iron plate
" or a water space, if preferred, which may or may not be covered
" with fire-bricks. I continue this plate some distance into the
" boiler, and leave an open space at the end thereof, putting on a
" bridge at some distance from the end of such plate, which
" bridge may be of fire-bricks or may consist of a water space
" as desired, or may sometimes be dispensed with. In front
" of the plate at the top I fit grid or opening or openings, or a
" grid and opening or openings combined, and at the top or over
" the grid I place a cast-iron plate, which may be covered with
" fire-brick or not, and in front of the grid I place a door or
" doors, which may be provided with slides, so as to form a hot
" air chamber. I sometimes put a plate below the cast-iron plate
" above described, thereby forming an air conduit through which
" air may be supplied into the hot air chamber; or . . . . in any
" other convenient manner . . . . At the top of the furnace I

" put a door or doors opening into the fuel chamber, and some-" times slides may be inserted into such door or doors for " pushing forward the fuel. The coal is supplied from a hopper " at the top . . . . The air passes through the grid or opening " . . . . into the incandescent fuel, and thence through the flue " or flues to the chimney. Air may be let in at the bottom of the " fuel plate" or otherwise. "I sometimes continue the plate " only part of the way into the boiler, and put in grate bars for " the remaining part. When putting in a fuel plate and bars " combined I prefer that the bars be a little below the fuel plate. " It is obvious that this arrangement is adapted to furnaces " generally, more particularly when altering Cornish boiler " furnaces."

Describes the application of the invention to a puddling furnace.

[Printed, 1*s*. Drawings.]

A.D. 1866, October 11.—N° 2634.

EVANS, Isaac Mark.—(*Provisional protection only.*)—This invention of apparatus for preventing explosions in steam boilers, consists in disposing a small tube inside the boiler. " One end " of said pipe or tube passes though the shell of the boiler and " presents its orifice to the fire; the tube rises through the " water and steam space to nearly the top of the boiler, where it " may be secured by an eye-bolt, and bends down so as to bring " its other end to the level of the lowest point at which it is " intended to let the water stand. The end of said pipe is " opened, and should any danger arise by reason of the water " sinking too low the steam rushes through the pipe and drowns " the fire. This arrangement it is seen acts as a safety valve " and is specially applicable to flued and waggon boilers. To " give warning that the water is sinking in the boiler two or more " small holes may be placed near the end of the pipe, one above " the other, so that the gradual damping of the fire would draw " the attention of the person in charge before the water really " sank to the level of the orifice of the tube. There may be more " than one of such tubes, so as to eject the steam on the fire at " different points."

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 16.—N° 2673.

NEWTON, Alfred Vincent.—(*A communication from Henry Feyh and George Towle Emery.*)—The object of this invention which relates to steam boilers, is to obtain a more rapid and economical evaporation, and an effectual protection to the boiler plates, tubes, and parts intervening between the fire and hot draughts, and the water, by promoting a forced and increased circulation thereof.

This result in upright steam generators is to be effected by means of a circumposed arrangement of small vertical tubes, which surround a circular range of fire-bars, centrally disposed in the bottom of the fire-box, which is encircled by water space inclosed by the outer shell. The lower ends of the tubes are set into the plate which forms the bottom of the furnace, and project beneath it, and the upper ends of the tubes are set into the plate which covers and forms the top of the furnace, and they project upwards through the water into the steam space. Another circle, containing half the number of larger tubes, surrounds the circle of small tubes, each large tube being alternately placed intermediately at the back, so as to be in a triangular position with two small tubes; the upper ends of these larger tubes are set into the top plate of the furnace and terminate immediately above it, and their lower ends are set into and, passing through the bottom plate, project coequal with the ends of the two small tubes. The three ends are then set firmly into a two way coupling box, and the ends of all the other tubes are trigonally engaged in the same way. When the boiler is at work, the heat generates steam rapidly in the small tubes, which rises direct into the steam space, and the water descending in the larger tubes, keeps up the supply, each one of the large tubes in this manner supplying two of the smaller tubes.

When the invention is applied to horizontal boilers, the arrangements are to be modified.

[Printed, 1*s*. Drawings.]

A.D. 1866, October 17.—N° 2677.

TONGUE, John Garrett.—(*A communication from Christopher Retallick James and Nathan Woodhull Condict, junior.*)—This *invention*, relates to stamps, hammers, and apparatus actuated by steam air or other fluid; it is applicable to various purposes requiring percussive force, and consists in "the attachment of "the stamp or hammer to a piston working in a cylinder, the "lower end of which is in constant communication with a "reservoir of steam, compressed air, or the two combined, or "other aeriform fluid or fluids of a sufficient pressure to raise the "piston with its stamp or hammer, and the upper end of which "cylinder communicates through a suitably operated valve with "a steam boiler in which there is a pressure of steam sufficiently "in excess of that of the steam or fluid in the reservoir to act on "the upper surface of the piston carrying the stamp or hammer "with a force sufficient to produce as heavy a blow as may be "desired, such valve afterwards opening to the exhaust." It also consists of "a combination with two stamps or hammers so "worked by pistons moving in separate cylinders of a valve "having passages so operated as to bring each cylinder alternately into communication with the boiler, and so producing "the alternate action of the pistons and their attached stamps "or hammers. Where only one stamp or hammer is used then "one of these cylinders may be smaller than the other, and the "function of its piston confined to operate the valve." It also relates to "operating the valve to alternate the action of the two "pistons by the action of each piston alternately as it completes "its ascending stroke, and whereby the blow of the stamp or "hammer of the other or descending piston is made or kept "full on the work during and after impact under the same "pressure of steam on the piston, irrespective of any variation "in the stroke consequent upon change in the bulk or height "of the work being struck." And it "relates to such a construction of the pistons and arrangement of the valve steam "passages thereto as that the incoming steam from the boiler "will exert a tendency to partially turn the pistons for the "purpose of turning the stamps."

[Printed, 10d. Drawing.]

A.D. 1866, October 17.—N° 2680.

KESSLER, Heinrich.—This invention relates to a self-acting lubricator, especially adapted for the cylinders and slide boxes of locomotive and marine engines, as it is designed only to come into operation when the steam is shut off from the cylinders, during the time the engine continues in motion and so long as the momentum of the train or vessel lasts, ceasing when the engine stops or when running under full steam. It is also intended that the apparatus shall supply oil, more or less, in proportion to the number of miles run by the engine, and it separates all gritty particles from the oil while it is in operation. The apparatus consists of a cup or vessel closed by a cover which is screwed on. It is supported by a hollow neck or stem, into which a central tube, which reaches towards the top of the cup, is fitted. A cotton wick which attracts the oil, hangs over the top of the tube, one end reaching to the bottom of the tube, which contains a wire strainer, and the other end to the bottom of the cup. Two valves are disposed in the hollow neck with an interposing spiral spring, which opens the lower valve when the steam is shut off, but which valve is kept closed at other times by the steam pressure. When steam is shut off from the engine, the upper valve is closed by the spring, but so long as the piston is kept in motion by the momentum, the valves open and close at every stroke. A modification is described and illustrated.

[Printed, 10*d.* Drawing.]

A.D. 1866, October 17.—N° 2687.

HASELTINE, GEORGE.—(*A communication from Norman Wiard.*) —This invention relates to regulating the temperature in steam boilers, and consists, 1stly, in raising by a sprinkling apparatus in boilers, a quantity of the water above the water level, so as to saturate and cool the steam when it becomes superheated. 2ndly, relates to apparatus for depressing or forcing superheated steam from the upper part of the steam space to below the surface of the water, in order that the surplus heat of such steam may be imparted to the water. 3rdly, consists in so arranging the working of the apparatus for agitating and cooling superheated steam, that it shall cease to work when the throttle valve opens, and commence working when the throttle valve closes. 4thly, consists in automatically controlling the action of agitating and cooling apparatus, without regard to the position of the throttle valve. 5thly, consists in reducing superheated steam when it attains to a certain heat, to the temperature of common steam. 6thly, consists in adjusting the degree of heat at which the apparatus shall commence to operate. 7thly, relates to drawing the hottest steam from remote parts of the boiler to be subjected to the showering or cooling process. 8thly, consists in combining two or more automatic regulators, disposed at different points in the boiler, for regulating the temperature of the steam at another point. 9thly, consists in so disposing in the steam space of a boiler a closed vessel which contains water, that the water shall be converted into steam by the superheated steam, which at the same time is reduced in temperature. 10thly, indicating on two indexes the superheating tendency in any part of the boiler, one being influenced by the pressure, and the other by the temperature. 11thly, relates to convoluting or coiling the pipe through which the water is raised in the boiler, and to a movable portion of the pipe connected thereto, which rises and sinks as it is alternately filled and emptied; and it further relates to other modifications and details with regard to the mechanical part of the invention.

[Printed, 3*s*. 6*d*. Drawings.]

A.D. 1866, October 18.—N° 2699.

HOSKEN, James.—(*A communication from Jones Saunders.*)—This relates to packing pistons and stuffing boxes, and consists in the use of a ring of closely spirally coiled wire, which is interposed in the chamber of the stuffing box between the ordinary packing. The transverse sectional form of the mandrel on which, in order to form the spiral coil, the wire is closely wound, is rectangular with the corners rounded off. When filling a stuffing box, a wooden ring is first introduced to rest upon the bottom of the chamber; a bevelled brass ring is next inserted; then the box is rather more than half filled with ordinary packing; upon this portion of the packing a thin metal washer is introduced, and then a sufficient length of the spirally coiled wire forming a ring or annular frill, is bent round and inserted; another thin washer is placed on the wire frill and the chamber filled up with ordinary packing, which is pressed down in the ordinary way by the gland and cover. One or more orifices are drilled from the outside through the walls of the box, so as to open into it level with the wire frill, and one or more oil cups are fitted outside to these orifices, so that when the packing requires moistening the lubricant can be introduced direct into the central space kept open by the wire frill. In some cases the metal washers may be omitted.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, October 22.—N° 2720.

TONGUE, John Garrett.—(*A communication from Joseph Augustus Miller.*)—This invention relates to the construction of steam boilers, the object being to economize, and accelerate the generating of steam, which is effected by closely surrounding the furnace sides and the boiler surfaces exposed to the fire and hot draughts with partition plates, so that only sufficient space is left between for a thin sheet of water, which is thereby separated from the main body of the water in the boiler, and constitutes an ascending current exposed to the greatest heat and rapidly converted into steam. The partition plates descend to near the bottom of the boiler and terminate upwards about the water level. Various devices in the form and mode of construction are resorted to, including a row or rows of vertical pipes ranged in series round the furnaces and flues; these pipes have two or more distinct internal channels open at each end respectively to the steam and water spaces of the boiler. Another part of the invention relates to collecting sediment and other impurities in funnel-mouthed tubes, which are closed at the lower end, and concentrically placed within the vertical water tubes, projecting thence at each end into the water spaces of steam boilers.

[Printed, 1*s*. Drawing.]

A.D. 1866, October 22.—N° 2723.

KIRK, Alexander Carnegie.—(*Provisional protection only.*) —" This invention has principally for its object to render steam " dredgers capable of being more easily manœuvred than hitherto; " and it consists in employing for that purpose centrifugal or " other pumping apparatus to be worked by the main or separate " engines, and to cause the projection by suitable passages or " orifices at the stern, of one or more streams of water. When " the dredger is formed with one or more wells for the endless " chain or chains of dredging buckets, the inlet opening or openings for the access of water to the pumping apparatus is or are " situated at the after end of such well or wells, but when the " dredger has the buckets at the sides, the inlet opening is placed " at the bow or forward part. As it is of great importance to " have the power of turning and generally manœuvring such vessels independently of the tug usually in attendance, deflectors " or rudders are attached to the stern orifices through which the

" water is projected, whilst to permit of reversing the direction
" of propulsion, either rotatory reversible pumps are used, or re-
" versing valves are fitted to the water passages communicating
" with the pumping apparatus."

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 24.—N° 2741.

OGDEN, John.—(*A communication from Ralph Ogden.*)—This invention, relating to "metallic packings for piston rods and
" other purposes . . . . consists in cutting a screw thread
" in the bush through which the piston rod or other rod works,
" and in this screw thread is placed a coil of square brass or other
" suitable metal wire forming the packing; the interior of the wire
" coil fits the exterior of the rod, and one end of the wire coil is
" secured to the bush, while the other end fits in a nut screwed into
" the top of the bush. When the packing requires to be tightened
" the nut is turned partly round, and as the end of the coil is
" fast in the nut, it is evident that the turning of the nut causes
" the coil of wire to close round the rod working within it. The
" nut when turned partly round is held by a stud fitting in holes
" in the nut, or by a ratchet wheel and catch or other equivalents."
The wire coil may either extend from end to end of the bush, or only partly through it, the remaining space being filled up with split rings to assist the coil. The lubricant is poured into a receptacle formed in the cap, and flows through a passage into a bush, guided by a strand of woollen yarn or other suitable substance.

[Printed, 8*d*. Drawing.]

A.D. 1866, October 24.—N° 2744.

WATTS, Joseph.—This invention relates to the construction of furnaces and fire places, and to obtaining motive power by means of the air draught required for combustion; the whole of such draught whilst passing through an air passage previous to its entering the furnace, is caused to impinge upon the vanes of a revolving fan, from the axis of which the power thus obtained is to be given off.

The fuel bed in these furnaces, which are applicable to steam boilers and other purposes, is of a pyramidal form with down draught passages round the base; it rises in the centre of the furnace, and when adapted to a furnace with a down draught, is composed of fire clay or other suitable material. The fuel is introduced through the top of the furnace, which is closed with a lid made air tight by dipping into a surrounding groove containing sand. The air draught passage opens into a chamber which circumvests the lower part of the furnace, the air passing into the latter through a close annular grating, composed of a series of angle iron rings closely arranged one above another, the several interspaces being about equal in breadth to the thickness of the angle iron. The fuel rests against the grating, and the draught passing downwards through the fuel, is carried over the heating surfaces and into the flues of a contiguous steam boiler, or elsewhere by means of a central flue pipe, surrounding which is the ash-pit.

When adapted to a vertical boiler having a central furnace with an upward draught, the pyramidal fire bed or grating is composed of concentric rings of angle iron, and the mass of burning fuel rests upon it and against the surrounding surface of the base of the furnace, which is circumvested with water space. The products of combustion pass direct from the lower part of the furnace through a series of vertical flue tubes circumposed in the water space, into an upper chamber, and thence downwards through an external casing into the chimney flue. A weighted piston in a small steam cylinder regulates the damper valve which admits the requisite supply of air to the furnace.

Describes an external furnace applied to a horizontal steam boiler, and the modified arrangements necessary for adapting the invention to domestic fire-grates.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1866, October 26.—N° 2763.

STORER, John.—This invention relates to lubricating apparatus, the chambers of which, by preference, are of a cylindrical form. The lubricating vessel is supported on a hollow stem, wherein a valve which is operated by a handle upon the outer end of the spindle, regulates the supply or outflow of the lubricant. The mouth of the downward passage out of the chamber is covered with a perforated cage or strainer, which is disposed in the centre of the chamber projecting upwards from around the mouth of the passage. The lid or cover is so fitted that it can be made fast by turning it about one-half round, so as to bring concentric segmental projections, which are externally formed on the opposite sides of the top of the chamber, under corresponding projections formed inside the bottom edge of the cover. The chamber is made air-tight by means of a cap, which fits upon the inner rim of the chamber, and is pressed down by a vertical screw which is fitted into a threaded hole tapped through the centre of the cover.

[Printed, 8*d*. Drawing.]

A.D. 1866, October 30.—N° 2797.

HUNTER, James.—This is an invention of a working engine, combined with apparatus for excavating and mining, and actuated by steam or compressed air. It is to be mounted on a carriage suitably arranged for affording the means of adjusting the operating movement of the tools or picks as the work progresses. Attached to the sole plate of the machine is a "fixed piston," which is formed out of a thick cylindrical ring or cylinder, the solid metal of which the ring is composed being nearly square in transverse section. A portion or segment of this ring is removed, leaving a segmental space of about 135°. A cylindrical cap cover, containing a deep annular recess divided at one point by a fixed diaphragm, completely incloses the fixed piston, which fits into the recess and forms a segmental steam chamber at the part where a portion of the piston ring is removed, divided by the diaphragm, to which, alternately on each side from a central passage, steam or compressed air is admitted, the radial contour of the ends of the fixed piston forming on each side of the diaphragm in the steam chamber, abutments for the steam. In this way alternate admission and emission of the steam takes place, whereby the diaphragm and consequently the cylindrical cap are caused to oscillate. The tool holders, which at their free ends carry the picks, are fixed projectingly to the sides of the cylindrical cap, and in their action describe the arc of a circle, terminating in the forward direction, by bringing the point of the pick or picks against the rock. The central steam admission and exhaust passages are caused to communicate respectively with the steam chamber, towards the termination of each movement of the diaphragm, by adjustable tappets on a segmental bar attached to the cylindrical cap, whereby the timely action of the central valve lever *is caused and* regulated. When in operation, the carriage whereon the apparatus is mounted, is moved on rails by any convenient means.

[Printed, 10*d.* Drawing.]

A.D. 1866, October 30.—N° 2802.

VARLEY, John.—This invention relates to self-acting apparatus for feeding steam boilers; it measures and registers the quantity of water used, and consists of a closed vessel, the smallest end of which is attached so as laterally to project from one side of a hollow oscillating axis, to which, horizontally fixed on the opposite side, is a projecting arm, which carries a counterbalance weight. The interior of the vessel communicates with the cavity in the axis, which at one end receives water from the water supply. The other end of the axis communicates with the steam boiler, and receives steam therefrom, which is conveyed into the outer end of the vessel by means of a flexible pipe, the ends of which are respectively attached to the axis and to the free end of the vessel, the steam and water passages in the axis being transversely separated by a diaphragm. Both ends of the axis are in communication with a double slide valve, which has an upper and an under face. The under face has three ports; the port on one side leads to the water supply, that on the other side communicates with the water space in the boiler, and the central port with the feed measuring vessel. The upper face of the valve is furnished with two ports, which regulate the admission of steam into the measuring vessel from the boiler. The apparatus is mounted on a suitable frame, the cavity in the axis being about level with the surface of the water in the boiler. After the feeding vessel has discharged its contents, and being lightened thereby, it is raised by the then preponderant weight of the counterbalance, at the same time that a weighted tumbler lever is also raised to a vertical position, and falling over the centre to the other side, suddenly operates the valve, and opens the water supply. The vessel then begins to refil, and as soon as its weight preponderates over the counterbalance, it sinks down, and the latter is raised, at the same time that the tumbler lever is brought back to a vertical position, and then by falling over the centre, so operates the valve as to cause the closing of the water supply, the opening of the water passage to the boiler, and the steam passage thence to the feeding vessel, whence, as soon as an equilibrium of pressure is established therein, the water flows into the boiler. When empty, the counterbalance weight preponderating, the vessel is again raised and the tumbler lever brought up and thrown over, thereby shutting off the steam and opening the water supply. In this manner the apparatus continues to feed according to the requirements of the boiler.

[Printed, 2*s*. Drawings.]

A.D. 1866, October 30.—N° 2805. (* *)

NEWTON, WILLIAM EDWARD.—(*A communication from Robert Bailey.*)—(*Provisional protection only.*)—Steam boilers are constructed in sections so that they may be opened and taken apart for cleaning the flues and spaces. A boiler has two principal parts divided vertically, each one being also divided into two distinct sections. The fire-grate extends under both, and between them is a vertical fire space over the fire chamber, leading directly into the exit flue at the top. The central sub-divisions on each side of the fire space have running through them a series of horizontal tubular flues. One of the outside sections may be built with tubular flues running through water compartments, and the other with a flat flue between two flat water compartments. The tubular fire flues pass transversely through the water compartments of one section, between which is also a fire space, and in the other section the fire flue is between the water compartments; and between both the external sections and the internal sections are other fire spaces. The two outer sections are pivoted to the central sections through trunnions at their lower ends by rods which pass through the shells on each side of the boiler. "The " central sections may be made with water compartments extend- " ing outside of the jacket sections and enclosing fire spaces " between them. The grate bars are made hollow, with their " ends opening into the central sections." "At the upper end of " the fire space is a damper opening into the exit flue," which may be opened when the fire is kindled, but for making steam it is closed, when the products of combustion will pass indirectly to the exit flue through all the fire flues and spaces.

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 30.—N° 2809.

BOULTON, MATTHEW PIERS WATT.—(*Provisional protection only.*)—*This invention* relates to the propulsion of ships and vessels by the force of currents of water, set in motion and caused to issue from the vessel, by the impulsive energy of jets of fluid under pressure. The fluid is generated or contained in an appropriate vessel so disposed within the ship, that the nozzles whence the jets issue from the generator may direct their force upon the water, which is admitted through channels from the outside, deflected by curved surfaces, and driven through other channels into the sea again in the direction of the stern. The fluid under pressure may be steam or other aeriform matter, and the direction of the ship's course may be changed by altering the line or curvature of the channels through which the water is driven out.

If applied to propel vessels through the air, the currents consist of air set in motion by the pressure of the jets and driven out thereby against the external atmosphere.

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 3.—N° 2848.

CALVERT, Francis Alton.—This invention relates to heating furnaces, applicable to steam boilers and heating apparatus. It consists in inclosing by brick or other walls the space above the furnace grate or fire bed, so as to form a high chamber extending the whole length of the boiler, wherein at the upper part the latter is supported upon suitable pillars or seatings, and so disposed as to expose in the chamber as much as possible of its available heating surface. From the chamber, the heaviest constituents of the products of combustion are at once carried off to the chimney by a flue, constructed at the extreme end of the chamber on a level with the ash-pit, whilst the lighter and hottest portions rise into the chamber, and remain for a time surrounding the boiler, imparting their heat to its heating surfaces. The furnace door is suspended by a chain, which passes over a pulley fixed on one end of a horizontal shaft, and is counterbalanced by a weight attached to the other end of the chain. Upon the opposite end of the shaft there is another pulley, which receives and holds the upper end of another chain, to which at its lower end a plunger is suspended. This plunger works up and down in a fixed vertical cylinder, and is made to fit air tight therein by means of india-rubber packing; an air tube at the bottom of the cylinder is
closed by a tap, which according to its position at the
ding the furnace, regulates the descent and gradual
ng of the door.

Drawing.]

A.D. 1866, November 7.—N° 2884.

BRACEWELL, William, PICKUP, William, and LUND, Benjamin.—(*Provisional protection only.*)—This invention relates to the valves of steam or other fluid engines. The inventors say "we make use of a hollow valve of a cylindrical or slightly "conical form working in a suitable case or seating, in the sides "of the valve are holes exactly opposite to each other, and of "equal areas; steam is admitted at both ends of the valve, and "enters the cylinder when required through similar holes made "in the sides of the valve seating or case which are also exactly "opposite each other, and of equal areas. By this means the "valve is caused to work in equilibrium whatever be the pressure "of steam in the steam chest or force of vacuum in the cylinder; "we also use another similar valve for the exhaust, and by the "combination of the two valves, and by suitable arrangements, "we are able to regulate the supply of steam and the cut-off at "any portion of the stroke required whilst the engine is in "motion; an index and finger in connection with the valve is "affixed to the outside of the steam chest to indicate the working "of the valve."

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 7.—N° 2887.

HUMPHREY, William.—This invention relates to the furnaces of steam boilers, the object being to economize fuel and effect the consumption of smoke. To this end an endless chain of transverse grate bars is used instead of the ordinary fixed range of longitudinal fire-bars. The ends of the transverse bars move along grooves formed in the sides of a frame, which can be withdrawn from the furnace when the endless range of grate bars requires cleaning or otherwise. The apparatus is actuated by mechanical means in front, above which a hopper is placed to contain fuel, which as the endless chain of bars slowly enters the furnace, is deposited thereon in regulated quantity and taken forward into the furnace, the chain returning underneath from the back of the ash-pit to the front, where it turns upwards round a roller level with the mouth of the furnace beneath the hopper.

[Printed, 10*d*. Drawing.]

A.D. 1866, November 7.—N° 2901.

SUTTON, Charles.—This invention relates to a "toy, to be "*actuated by steam.*" It "consists of a bulb of glass with a

" tubular stem issuing from the top, and having a small orifice
" at the end ; this instrument is suspended by means of a chain
" or wire from any suitable support, and there is a swivel in the
" chain or wire which allows the instrument to rotate freely; the
" bulb is filled with water or liquid by warming it over the flame
" of a spirit lamp and then plunging the point of the tubular
" stem in the water or liquid. The instrument being thus pre-
" pared, the bulb is heated by the lamp until the water or liquid
" boils, and the steam then issuing from the orifice at the end of
" the tubular stem causes the instrument to rotate rapidly, the
" stem being directed in such manner that the steam issues in a
" line at right angles to the axis of the bulb or nearly so."

[Printed, 8*d*. Drawing.]

A.D. 1866, November 7.—N° 2902.

HINDLEY, Edmund Samuel.—(*Provisional protection only.*)—This invention relates to slide and expansion valves for steam and other engines, and to apparatus connected therewith and in relation with the governor. It consists, 1st, in operating the variable movements of the expansion valve without using an eccentric or any other direct mechanical aid. The expansion valve rests free upon the back of the slide valve, and is carried to and fro by it until suddenly arrested by coming into contact with adjustable stops, arranged respectively in each end of the valve box. When this takes place the main-valve slides under the expansion valve for the remainder of its stroke in either direction, by which sliding movement the induction port is covered by the expansion valve, and the steam thereby cut off; this may be effected at any point in the stroke by simply regulating the position of the stops, thereby obtaining a greater or less degree of expansion; this constitutes the 2nd part of this invention. The 3rd part consists in connecting the expansion valve stops by suitable mechanism with the governor, in order that the steam may be cut off earlier or later in the stroke of the piston, so as to retard or accelerate its movements, and thereby keep the engine running at its normal speed.

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 8.—N° 2907. (* *)

BAGSHAWE, John James.—(*Provisional protection only.*)—*Improvements* in preventing smoke in furnaces, "especially ap-

"plicable to the furnaces of boilers." In the brickwork of the flues or furnaces are built combustion chambers, into which is conducted atmospheric air. The air from these combustion chambers is conveyed through channels to the front of the fire and discharged amongst the fire gases. Chambers are formed in the bridge into which air is admitted through openings underneath the fire-bars or otherwise. The air from these chambers is conducted along flues formed on one or both sides of the furnace. This air is also discharged over the upper surface of the fire in the furnace. Small openings are formed in the upper side of the chambers in the bridge, by which jets of rarefied air may be admitted to the under side of the flame in its passage over the bridge. Sometimes also cold air may be admitted into the furnace through the door.

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 9.—N° 2922.

DŒRING, Frederick Bernard.—This invention relates to engines for boring rock and other mineral, and to the frames or stands for such engines. It is in part supplemental to prior Letters Patent, which bear date 13 December, 1865, No. 3218. Instead of, as formerly described, forming a complete screw thread upon one of the two supporting shafts of the engine, a portion of a thread is formed on each shaft. The toothed wheels are dispensed with, and a worm wheel moved by a ratchet wheel, is placed to work between the two supporting shafts, on the neck of the cylinder cover, the ratchet wheel being actuated by a pawl connected to a lever moving thereon. A second ratchet wheel for giving the turning motion, is situated behind the lever, and worked from it by a second pawl; this lever is put in motion by a connecting rod from the transverse rocking shaft formerly described. By these means an intermittent rotary motion of the piston rod and boring tool is produced, the advance being effected by the worm wheel, to free which, when the hole is completed, the two shafts are moved asunder.

The invention further relates to working the slide valve, which is moved by a spring or air cylinder attached to the forward end of the valve rod. Fitted behind the valve is a catch supported by a spring, which is, towards the latter part of the forward stroke of the engine, relieved by the blow of a tappet or hammer which is mounted on the transverse shafts, whereupon the valve is "drawn "through" either by the spring or the compressed air in the cylinder. The other parts of the invention relate to the frames or stands of boring engines, with the provisions made for securely fixing them in the workings during the time they operate. Also to the arrangements and combination of the parts of frames and stands of boring engines employed for sinking vertical shafts.

[Printed, 2*s*. Drawings.]

A.D. 1866, November 10.—N° 2925.

GOBERT, Auguste.—This invention relates to lubricating the axles of fixed engines. When applied to a horizontal shaft, an oil cup or reservoir is fixed or formed in the framing at a lower level, or is placed underneath the axle bearing, and in some cases supports the cushion or coupling on which the axle revolves. A hole or holes through the centre of the lower coupling communicate with the interior of the oil cup and lubricant, which by capillary attraction rises up a fibrous wick or strands of material capable of absorption, the lower ends of the wick or strands being immersed in the cup or reservoir, and the others, supported by a case or collar and rising through the holes, are brought into contact with that part of the axle which bears upon the coupling, and kept there by means of a spring or other contrivance. Various arrangements are described and illustrated, including the application of the invention to a vertical shaft, a pulley, a piston guide, and a connecting rod. An opening for cleansing the reservoir is closed by a plug.

[Printed, 10*d*. Drawing.]

A.D. 1866, November 10.—N° 2934.

WHITE, George.—(*A communication from Ernesto Ansaldi.*)—This invention relates to steam engines, which are so constructed, that the "dead points" are turned without the aid of a fly wheel. For this purpose two cylinders of differing diameters are employed; they are placed either side by side, or the smaller is placed concentric within the larger cylinder, which is fitted with an annular piston. The manner of turning the dead points is effected by causing the large cylinder to consume the steam, part of which passes through the small cylinder, "and by reacting at "*the required* moments on its piston cause the piston of the large

" cylinder to overcome its dead points, the crank of the piston of " the small cylinder being situated at right angles ,with those of " the piston of the large cylinder in such manner that whenever " the crank or cranks of the large cylinder merely reach their " dead point the crank of the small cylinder is nearly exerting its " maximum effect, so that the cranks of both cylinders mutually " cause each other to overcome their dead points, thus allowing " of doing away with the use of a fly wheel, and rendering my " improved engines particularly useful for marine steam engines. " The general arrangement of the engine does not differ materially " from that of ordinary steam engines."

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1866, November 10.—N° 2940.

KORSHUNOFF, Nicholas.—This invention relates to various processes connected with the manufacture of malleable iron and steel, to boilers for generating gases or vapour, and to taps, cocks, and valves.

Introduces "into the liquid metal in the puddling or other " furnace used for converting cast iron into malleable iron or " steel, the vapour of nitric acid or chloric acid, or other acid rich " in oxygen or their salts, and also the vapour of hydro-acids or " other materials rich in hydrogen, or the salts of hydro-acids, or " mixtures of the said acid vapour either alone or combined with " a blast of air, or liquid hydro-carbon in a state of vapour may " be introduced into the liquid metal. By the introduction of " the oxidizing gaseous liquid or solid compound the decarbonization of the iron and the oxidation of the siliceous matters " in the iron are promoted."

Produces from scrap iron or steel, cast iron of pure quality suitable for the manufacture of steel, by placing in a cupola furnace alternate layers of scrap and charcoal or coke mixed or not with anthracite or similar fuel. The fire is urged by a fan producing a high-pressure blast, whereby the scrap is melted down and carbonized.

Describes the method of introducing spirals of wrought iron into the moulds employed for casting large shafts and other solid articles, and during the process of casting, forming the hollow interiors or cavities in cannons, cylinders and tubes, by forcing by means of steam or hydraulic pressure, suitable dies into the moulds, to be withdrawn just before the metal solidifies.

The boilers employed for generating acid or other vapour are enamelled internally with a coating of glass, and the taps, cocks, and valves employed are enamelled or glazed in the same manner.

Describes the construction of puddling furnaces, the apparatus employed for stirring the metal by motive power, and the mode of introducing a flux.

[Printed, 2s. Drawings.]

A.D. 1866, November 12.—N° 2954.

ROUTLEDGE, William, and OMMANNEY, Frederick Francis.—(*Provisional protection only.*)—This invention relates to self-acting apparatus for cutting or getting coal, boring rocks, or other substances; it is also applicable to steam hammers and other machines. The coal getting apparatus consists of a cylinder with one end closed, a valve box, and side passages, all in one piece, the open end of the cylinder being fitted with a gland, in the hole of which is placed a tool or cutter holder. Within the cylinder there is a long piston, the two ends of which are united by a neck, and fit to the diameter of the cylinder. The space which surrounds the neck communicates with both ends of the valve box, and by means of a hole, with the atmosphere. The valve box is bored out and fitted with a circular valve, a pipe for the necessary supply of steam or compressed air, and an outlet for the exhaust. The valve is shifted to and fro by the movements of the piston, which operates the tool by causing it to act by a succession of rapid blows, unlike the long and powerful strokes of other coal getting machines. The size of the machine admits of its being held and directed by the workman, so as to operate in any desired position, either picking or boring, and at the required angle. The apparatus may be applied to various useful purposes, such as surfacing, squaring and working out details in stone cutting, and to hammering metals.

[Printed, 4d. No Drawings.]

A.D. 1866, November 13.—N° 2971.

BROOMAN, Clinton Edgcumbe.—(*A communication from Urbain André Chauveau and Henri Marie Joseph le Nepoon de Carfort.*—(*Provisional protection only.*)—This invention relates to a locomotive engine, to be worked by steam or other motive agent, for the purpose of towing or hauling barges or vessels, or for other tractive uses. The steam boiler mounted on a separate frame, is connected by suitable pipes with the cylinders, of which there may be either two, or four coupled in pairs. These impart rotary motion to two crank shafts, each of which carries a chain wheel, whence locomotion is obtained by means of endless chains and other chain wheels, attached respectively to two wide bearing wheels, which act independently of each other, and constitute the tractive agents of the apparatus, which by means of suitable levers, operated by the hand of the attendant, is caused to go either forwards or backwards, and to stop or turn in any desired direction. The back frame, which carries the generator, is supported upon two other similarly constructed bearing wheels, and upon a pivot disposed near the front of the furnace, behind or upon the axis of the driving wheels. When the pivot is placed behind the driving wheels, another wheel is employed, in order that the equilibrium of the apparatus may be maintained. The length of the apparatus may be diminished, and the whole weight be brought to bear upon the driving wheels, by fitting the boiler upon the same frame as the cylinders."

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 14.—N° 2976.

BELLEVILLE, Julien François.—This invention relates to a spring regulator, applicable as a pressure gauge and to other purposes, It consists of a number of concave discs, fixed together alternately face to face and back to back, so as to form a series of thin chambers, wider towards the centre by reason of the concavity of the discs, the edges of which, with a ring or washer of india-rubber or other suitable material interposed, are fixed together. The centres of the discs are removed, so as to form a passage through the series for a central spindle, which is fixed to the centre of a circular plate. This plate forms the end of the spring, and to it a single disc at the end of the series is attached. The disc at the other end is fixed to the cover of the casing which is made sufficiently strong to resist the pressure of steam or other fluid which may be admitted to the casing through the inlet. The pressure acts by compression upon the series of discs, and according to its weight or force, the spindle is projected more or less through the cover, and is connected " by means of links " levers, rods, wheels, or chains, according to the nature and

" requirements of the case, with the engine or apparatus requiring " to be regulated, controlled or compressed." A regulating discharge cock is attached to the outlet, through which, by means of a force pump worked by the engine, a constant discharge of air or fluid, as the case may be, is going on. When the cock, as regulated to the normal speed of the engine will not relieve the pressure, a compression of the spring takes place, and the throttle valve or expansion gear of the steam engine, or the sluice valve if the power is hydraulic, are correspondingly effected. When applied to steam boilers, the action of the spring, caused by excess of steam pressure, is brought to bear upon the flue damper which is closed more or less thereby.

[Printed, 8*d*. Drawing.]

A.D. 1866, November 14.—N° 2986.

PAGE, Thomas.—This invention relates to " locomotive engines " and their permanent ways, applicable for steep gradients and " alpine locomotion," the object being to prevent slipping, and produce by means of broad surfaces of appropriately prepared material, a mutual adherence between the driving wheels and the surface of the tram or road. The inventor states :—" I may " sometimes adopt the ordinary locomotive and permanent way " on the levels and even on slight gradients, but . . . . for steep " gradients I dispense with the ordinary locomotive and employ a " locomotive running on a broad tramway of stone, wood, or other " material, such tramway being roughened or serrated or otherwise surfaced to afford the bite required for the driving wheels " of the locomotive engine. These driving wheels I make with " peripheries of iron, wood, or other material adapted to hold or " bite the tram, and plain, serrated, or otherwise roughened for " that purpose; thus at steep gradients, in addition to the ordinary lines forming the continuation of the levels and on which " the train runs, I dispose outside or inside the ordinary rails, the " broad trams . . . . . on which the locomotive engine rests on " its corresponding broad wheels. In order to keep the engine on " the track I use flanged wheels or guide wheels " disposed at an angle to bear on the inner edges of the rails, the weight of the engine resting entirely on the trams. " In locomotives so applied " I prefer to couple all the wheels carrying any weight. Instead " of a separate locomotive engine being used, the ordinary loco-

" motive might be fitted with additional tram wheels, or the " wheels may be increased in breadth and the tramway provided " for their bearing and running at the steep inclines."

[Printed, 6*d*. Drawing.]

A.D. 1866, November 15.—N° 2989.

LYTTLE, William Alexander.—This invention relates to various arrangements, in connection with steam boilers, for heating the air-draught by means of the heat remaining in the products of combustion after their passage through the flues. The ash-pit and furnace are closed, and the air is mechanically either propelled or drawn through separate channels in a heating apparatus, which is interposed, in the chimney flue passage, or in such a position in or about the boiler or chimney, that the fresh air draught may descend or pass through the separate channels in the direction towards the furnace, and the hot draughts from the furnace flues pass through intervening channels in the contrary direction. A section of the heating apparatus may be arranged to heat the feed water on its passage to the boiler.

Introduces liquid fuel in a finely divided state, into the furnace above the burning bed of solid fuel, in order to inflame the gases and be consumed in conjunction therewith. For this purpose an " atomizer " is used, and various other means for scattering comminuted particles of the inflammable fluid over the burning fire, are employed in connection with an air blast, with which steam may be commingled, or a jet of steam alone may be used for the purpose.

[Printed, 6*d*. No Drawings.]

A.D. 1866, November 15.—N° 2994.

ERSKINE, James.—(*Provisional protection only.*)—This invention relates to the construction of steam engines, which the inventor states, " consists in utilizing the force of the steam " expended on the bottom and top of the cylinder during the " up-and-down strokes of the piston. To effect this I construct " the steam cylinder so that it slides and has a similar motion to " the piston, but in a reverse direction; I mount the cylinder on " a sliding bed, or in suitable guides or bearings, so that it " can travel easily; I connect the cylinder with one crank and the " piston with another, the throw of each crank being half the

" length that it would be in the ordinary way. The shafts con-
" nected with each crank revolve in different directions, the two
" cranks being each on the opposite dead centres at the same
" time. The crank shafts may be connected together in any
" suitable way by toothed wheels, and the two motions thereby
" brought into one, or they may have two cranks with a connect-
" ing rod. The steam and exhaust pipes are made telescopic
" with stuffing boxes, and the travel of the cylinder works the
" slide valve."

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 15.—N° 3001. (* *)

DAWSON Edward.—(*Provisional protection only.*)—A method for preventing smoke and saving fuel.

The door of a boiler furnace is to be made with openings in the centre, and a round hole at the top. Behind the door inside the furnace is a box as large as can be allowed for opening of the door. In this box is "placed a partition of metal plate slanted " at the top towards the door at about 60 degrees." These plates are to be "perforated at the top and bottom but not in the " centre, so that air entering the furnace door must travel to one " end of the box." and gets heated "before it passes into the " furnace through the plate which is perforated in the centre " only." The box is "to have at the bottom two holes 1″ in " diameter and the top ½″." Should the temperature of the furnace get low a steam pipe perforated at the end is brought into action for a short time. This steam pipe is to have a joint, so that it may be turned up out of the way of the door.

[Printed, 10*d*. Drawings.]

A.D. 1866, November 17.—N° 3016.

BOLVIN, Julien.—This invention relates to a steam engine, the piston of which oscillates in an annular chamber on a fixed horizonal central axis. The piston extends about two-thirds round the space; its ends, which are acted upon by the steam, presenting faces cut to the plane of a line radiating from the central axis or shaft, which as the piston ends are alternately acted upon by the steam, gives vibratory motion to a lever arm. The outer end of this arm is jointed to a connecting rod, the other [illegible]h is coupled to the throw of a crank shaft, whereby the reciprocatory movements of the piston are converted into the rotary motion of the crank shaft, whereon strap pulleys are mounted for giving off power. In a vertical line under the axis, the annular chamber is transversely divided by a diaphragm, which resists the pressure of the steam alternately on either side, as the piston ends by turns make their curvilinear stroke. The induction and exhaust steam ports, which open to the annular space on their respective sides of the diaphragm, are governed by a slide valve, which obtains motion direct from an excentric on the crank shaft.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, November 17.—N° 3017.

DIXON, CHARLES WILLIAM.—(*Provisional protection only.*)—This invention consists of a rotating slide valve. "The exhaust " port may or may not be cast in one piece with the cylinder, as " is usual in ordinary engines. The exhaust port is brought to " the surface of a circular plane or convex face along with the " steam ports, but is placed in the centre and made of a circular " form." The two steam ports are concentric with the central circular exhaust port, being separated by a sufficient thickness of metal, so as to form segmental divisions of a larger circle, on the opposite sides of the exhaust. " The valve is to have a circular " face of the same size and to cover the face on which the steam " and exhaust ports are placed, and is to have two openings in it " bounded by the same arcs as the steam ports are, but the other " dimensions are to be regulated by the engineer so as to give " whatever cut-off of steam or exhaust he thinks proper. One of " these two orifices opens directly into the steam chest through " the back of the valve, but the other opening is connected by a " covered passage on the back of the valve with the exhaust port " in the centre, so that when the steam is entering at one port it " is exhausting at the other. The back of the valve is made " cylindrical and brought through a stuffing box at the back of " the steam chest, and made of the same diameter as the exhaust " port; . . . . . or if expansion is used in the cylinder, it " would be an advantage to be made larger. The valve may be " worked by eccentrics from the crank shaft or direct from the " piston rod."

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 17.—Nº 3025.

NEWTON, William Edward. — (*A communication from Claudius Edward Habicht.*) — This invention relates to steam machinery adapted for submarine excavations, pulling up old piles, and breaking up and removing " crib work " or the remains of old sunken vessels. The vessel which carries the apparatus is fitted with steam power. One small oscillating steam cylinder is employed for raising and lowering, by means of a crab winch chain and pulleys, a pointed beam, which is caused to descend through a fixed vertical socket, and sink into the bed of the river or water for the purpose of holding the vessel whilst the working operations go on. The main steam cylinder is employed to work a duplex power winch containing two winding barrels, which at the required time are brought into activity by friction clutches. The dredging apparatus consists of a " grasping bucket," which is formed by two segmental or quarter divisions of a cylinder jointed together at the axis. This bucket is suspended by two chains from a pulley, which depends from the upper free end of a jib boom or spar, that swivels at its lower end on a fixed centre attached to the deck, the upper end of the boom being supported at a suitable angle by a chain attached to a mast or upright, which is maintained in position by diagonal stays. The ends of the two chains which support the bucket are fastened, one to each of the winding barrels; the other ends of the chains being arranged to operate separately and with different effect. When the bucket and apparatus depend from the lowering chain, the upper edges of the two halves of the bucket are, by means of toggle levers to which the chain is attached, brought together over the axis so as to form an inverted bucket, in which position it is lowered to the bottom of the river or water; the other chain is then brought into operation, and whilst being wound on its barrel, acts first to close or bring the under edges of the two halves of the bucket forcibly together beneath the axis; these act like a pair of closing jaws, scraping mud and gravel or material into the bucket, which when closed, is raised by continuing the pull or winding-on of the chain. When brought above the surface, the free end of the boom and bucket are swung over a barge or receptacle, the bottom of the bucket is opened by a pull on the other chain, and the contents discharged. The under edges of the bucket are armed with teeth, so that they may close upon and tear up pieces of wood and other matter which happens to come between them.

[Printed, 10*d.* Drawing.]

A.D. 1866, November 19.—Nº 3027. (* *)

GLENTON, Samuel.—(*Provisional protection only.*)—"Improvements in the furnaces of steam boilers."

The bridge is constructed hollow by inserting a plate beneath the brickwork of an ordinary bridge. The upper surface of this plate is on a level with the fire-bars, the ends of which rest upon it. In this plate is cast a slot in the direction of its length, or running across the flue, and about three-fourths of the width at the part where it is placed. The plate is then built upon all round the hole to form a bridge of the required height. Air is admitted through the fire door by the usual slide shutter arrangement being thrown to the upper part of the flue by a shield on the door. The dead plate is also perforated for the admission of air.

[Printed, 4*d.* No Drawings.]

A.D. 1866, November 19.—Nº 3032.

SIMPSON, Cortland Herbert.—(*Provisional protection only.*)—This invention relates to steam engines combined with a wheel for propelling vessels, which consists of a rotating cylindrical drum, furnished with movable radiating paddle blades, which are projected from the periphery during a certain portion of the revolution, to act upon the external water. Instead of transmitting power to the axis in the ordinary way, the engine and propelling cylinder or drum wheel are combined, a steam cylinder and piston being furnished to actuate each paddle blade. The bottom ends of these steam cylinders, which are circumposed round a central tube, abut against the tube, which receives a fixed hollow axis, whereon the propeller wheel revolves. This axis contains separate passages for the induction and eduction of the steam; it projects from each side of the propelling wheel, which it supports by resting in suitable bearings. The induction of the steam and the exhausts are arranged to take place when the respective steam passages out of the central axis, as the propelling wheel revolves, are brought to correspond with the inlet ports into the cylinders, and the exhaust is managed in the same way, the paddle blades being by turns projected during one-fourth of the revolution, and retired during the remainder. The projection of the blades by the steam power rotates the propelling wheel, and the wheel propels the vessel. Part of the apparatus may be used to condense the exhaust steam, or an ordinary condenser may be contiguously placed in communication with the eduction pipe.

[Printed, *4d.* No Drawings.]

A.D. 1866, November 20.—N° 3048.

ROBERTSON, John.—This invention relates to apparatus for regulating the pressure and flow of steam and other fluids, and to other apparatus for effecting the discharge of air, and of the water of condensation, without permitting the escape of steam.

For regulating pressure, the counter-pressure of a column of mercury is availed of. A covered valve box, with double equilibrium valve interposed between inlet and outlet passages, is employed. The valve spindle is tubular, and carries at its lower end a float which rests upon a bed of mercury. The upper end of the spindle passes upwards through the top of the box, and receives an adjustable steam tight telescopic tubular slide, which is surmounted by a cup, up into which the mercury is raised by the steam pressure. The action of the valve is regulated by the quantity of mercury under the float, being more or less closed according as the pressure forces it up into the cup, the stated pressure being regulated by the height at which the adjustable slide is set. In a modification, a spring lever and adjustable counter-weight are substituted for the float and mercurial column.

The apparatus for discharging water of condensation, consists of an outer covered vessel with side inlet and outlet branches towards the top. Another vessel floats within the covered vessel, and has attached to and projecting upwards from its bottom so as to pass up inside a tube which depends from a top chamber in communication with the outlet passage, a valve spindle surmounted by a valve, which opens the way for the outflow into the top chamber, when by the accumulation of water in the floating vessel the latter is depressed and the valve opened.

For effecting the discharge of air without loss of steam, a valve is raised by the changing form of curved bars of thin metal, caused by their expansion on the admission of steam.

[*Printed, 10d.* Drawing.]

A.D. 1866, November 20.—N° 3052.

KNIGHT, EDWARD HENRY.—This invention relates to governors the primary feature of which, consists in giving to the “hinging axes” of the arms, a capacity for adjustment on a plane at right angles to the axis of revolution, the balls swinging freely from a kind of universal joint, formed by the hinging axes to which they are suspended, and which permit the vertical motion of the balls, and their self-adjustment on the horizontal plane of the bearings of the hinging axes, permitting the outward swing, without effecting the free movements of the balls by the use of guides; the balls being free to swing in such direction as may be induced by their speed and proportion, ascending and descending under changes of speed, in such curves as may result from the opposing forces of gravity and centrifugal impulse. The hinged axes to which the pendulous arms are jointed, are furnished with short vertical pins, which are free to swivel respectively in holes at the end of a cross piece or bearing, which is fixed on the governor spindle; and the vertical sliding part of the governor which transmits the effect of the variations in the speed, is actuated by an excentric curved slot or cam way, formed above the joint on the extreme end of each arm. Various modifications in the details are described and illustrated.

[Printed, 1s. 2d. Drawings.]

A.D. 1866, November 21.—N° 3056.

CLARK, WILLIAM.—(*A communication from Laurent Chevalier.*)—This invention relates to steam boilers, which are of the multitubular class. The boiler described is horizontal, the body cylindrical, and the fire-box, which is surmounted by a steam dome, is oviform, so that the bottom of the fire-box, which is inclosed in water space, comes below the body of the boiler. The furnace opens into one cylindrical flue tube, which terminates in the rear of the boiler in a combustion chamber covered with a flat plate, perforated to receive the curved ends of a group of small return flue tubes, which receive and conduct the hot draughts through the upper water space to a smoke box in front, wherefrom rises the chimney flue. The fire box and the fore ends of the small tubes are set in and rivetted respectively to the front plate, which is bolted to a flange of angle iron rivetted round the fore end of the shell, to which also the back plate or end is attached in the same manner for the purpose when necessary of easy removal, and by reason of the back ends of the small tubes being bent to a right angle with their main length, they are not effected by the unequal expansion of the parts.

[Printed, 8*d*. Drawing.]

A.D. 1866, November 22.—N° 3065.

HASELTINE, George.—(*A communication from Charles Burleigh.*)—This invention relates to machinery combined with steam power for drilling rocks. The apparatus comprises a cylinder, in which a piston is caused to reciprocate motion, by the elastic force of steam or compressed air. On each side of the cylinder there is a projecting rib or slide, which fit into grooves in a long rectangular slide frame. The back of this frame is bevelled to slide in a dovetailed recess formed on the face of a carrying bracket, which is constructed in two hollow parts, to embrace and afford the means of attachment to a strong central fixed column, to which the bracket, which carries the apparatus, is securely fixed in the required position, and while the operation is going on, the cylinder is caused to advance by a feed motion, so as to keep the drill, which is attached to the fore end of the piston bar, up to its work. The effect on the rock is produced by successive blows of the drill tool, to which, by means of a ratchet in conjunction with a spiral groove in the piston bar, intermittent rotative motion is imparted after each blow. The slide frame can be set to any angle, so as to command any spot on the face of the working, and the feed motion, operated by hand or otherwise, can be regulated according to the nature and hardness of the rock, and consequent progress of the drill.

[Printed, 1*s*. Drawings.]

A.D. 1866, November 23.—N° 3081.

ROBINSON, John.—(*Provisional protection only.*)—This invention relates to apparatus for heating the feed water of steam boilers, and consists, 1st, in placing a series of eight or more large pipes transversely or otherwise within the boiler flue. The ends of these pipes are built in and project outside through the walls of the flue, where each two alternate ends are united by small return tubes, so as to form a continuous passage from end to end through the whole series, through which the feed water is caused to flow and thereby attains a high degree of heat as it is forced on to the boiler. 2ndly. Employing scrapers for removing accumulations of sooty matter from the external surface of boiler tubes, such scrapers being furnished with handles extending to the outside of the boiler, in order that they may as occasion requires, be drawn along the upper surface of the tubes and thereby remove all deposits of soot, the scrapers being formed to fit to the semicircle of the tubes.

[Printed, 4*d.* No Drawings.]

A.D. 1866, November 23.—N° 3082.

ROBINSON, John.—(*Provisional protection only.*)—This invention relates to heating the feed water for locomotive steam boilers during its passage through the feed pipes. For this purpose a box containing a series of pipes, is disposed in the smoke box, and so arranged in connection with the exhaust pipe, that the exhaust steam from the cylinders passes through the box, and imparts its heat to the series of pipes within, which heat passing through the metal of the pipes is carried off by the feed water, as the latter is forced through the pipes on its passage to the boiler. Two boxes containing heating pipes may be employed, each separately connected with the exhaust pipe from one of the cylinders, the steam emitted from each box uniting and issuing through one blast pipe. If desirable the additional heat of a jet of steam admitted from the boiler, may be used in conjunction with the exhaust steam.

[Printed, 4*d.* No Drawings.]

A.D. 1866, November 26.—N° 3105.

THOMSON, William Richard Middlemore.—(*Partly a communication from Nicholas Thomas and Thomas Somerville.*)—This invention relates to the cutting off the ends of metal tubes or pipes, so as to transversely divide them, or reduce them to the precise length required in the construction of tubular steam boilers, and for such like purposes. The apparatus is susceptible of numerous modifications, which are fully illustrated and described consisting of various mechanical appliances some fixed and others portable, to which, for the purpose of operating them, either motive power or manual labour may be applied. The tubes are cut either from the inside by one class of these tools or instruments, or from the outside by another class, a rotary motion being required to set them in operation. For cutting from the inside of the tube under operation, a spindle in one or more parts, fitted with a lateral cutter or cutters is employed. The cutters are gradually projected from the sides of the spindle by a double screw or wedge action. For cutting from the outside towards the centre of a tube, hollow or socketed spindles are employed; these revolve on the tube, and are fitted with cutters which are caused to gradually converge, enter the metal of the tube, and by degrees cut through it.

[Printed, 1*s.* 4*d.* Drawing.]

A.D. 1866, November 27.—Nº 3122.

DICKINS, THOMAS, HEYWOOD, HARVEY, and HOLLAND, JOHN.—This invention relates to furnaces and steam boilers. As regards furnaces the patentees discover by experiment, they cannot usefully carry out their proposed arrangement of movable fire-bars as provisionally described, and therefore lay no claim to it.

The steam boiler described consists of an outer cylindrical upright casing of two diameters, which are united by plates inclining to an angle, in form of a frustum of about 45°. The larger or lower section contains a low circular furnace, around which, between it and the cylindrical shell, there is a narrow annular water space; the furnace crown rises at an angle, and receives the lower end of a circumposed series of flue tubes, which pass up through the water space slightly inclining outwards, and open into external brick flues through the inclining plates of the shell. The outer ends of the bars which compose the fire-grate surface, rest upon an annular flange fixed inside round the lower part of the furnace, their inner ends resting upon a circular column which rises from the centre of the ash-pit. The fuel is fed from a hopper at the top of the boiler, by means of a conical tube centrally attached at its base or lower end, to the crown of the furnace, and passing up through the water space above and through the steam space, which is contained in the smaller section of the shell, is attached centrally to the crown of the boiler. This tube, which is closed by a lid, is kept filled or partially filled with fuel, the weight of which principally rests *below upon the* central column which supports the ends of the fire-bars. A side aperture closed by a fire-door is provided, giving access to the furnace for kindling, and also for stirring the fire when the boiler is at work.

Modifications are required in the arrangement of the flue tubes when the boiler is applied to marine purposes.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1866, November 27.—N° 3125.

GEORGE, RICHARD.—(*Provisional protection only.*)—This invention relates to that class of engines from which motive power is obtained by the expansive force of steam, or from the sudden expansion of air produced by the combustion of inflammable gases or vapours within the cylinder, which oscillates on hollow trunnions, wherein suitable passages are formed for the ingress and egress of the steam or fluid, a cut-off valve for working expansively being disposed on the face of the inlet port, which valve is attached to a spindle operated from the outside by levers actuated by the oscillatory movements of the cylinder. When the motive power is obtained from the inflammation of explosive gas, the arrangements require modifying; suitable valves or stop cocks regulated to act at the proper time are provided for admitting the explosive gas, and closing the inlet before the gas is inflamed by "electric igniters," which are placed respectively in the ends of the cylinder, and by means of a pointer actuated by the crank shaft, are alternately brought into correspondence with a metallic body charged with electricity from the positive pole of the battery.

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 29.— N° 3143.

FIELD, JOSHUA.—This invention relating to the construction of steam engines, consists :—

1st. In adapting a small high-pressure cylinder on "Woolf's" system to the ordinary double piston rod. The high-pressure cylinder is, in order to save space, partly recessed into the front end of the large cylinder, the covers of each being easy of removal and the valves accessible; if desired the small cylinder may be recessed into the back end; in either case the piston and cover of the large cylinder are formed with recesses to correspond. The small piston rod, working steam-tight through the end of its cylinder is centrally fixed to the large piston, which acts externally upon a crosshead by means of two piston rods respectively disposed, one on each side the small cylinder, diagonal to the plane of the crank shaft, which passing between the piston rods is actuated by a connecting rod jointed to the crosshead. The valves are arranged to admit high-pressure steam to the small cylinder, which exhausts into the large cylinder. The high-pressure steam may be cut off at half stroke. A pair of these double cylinder engines are illustrated.

2nd. A combined arrangement of three cylinders to work the steam with a great amount of expansion. The cylinders are disposed side by side, the piston of each having two piston rods which are fixed diagonal to the plane of the axes of the three cylinders to make room for a three throw crank shaft, which passes intermediately between the ends of the cylinders and their respective crossheads, the several crank throws being disposed in relation to each other at angles of 120°. The steam direct from the boiler is admitted into one (the central cylinder by preference) where it may be cut off at half stroke or later, working the remainder expansively. This cylinder by means of suitable valves and passages is caused to exhaust into the other two cylinders, where the steam reaches its available terminal expansion. The stroke of the central cylinder may be shorter than the others.

3rd. Places an alarm whistle or bell in a convenient position on the steam pipe or near the engine, for the purpose of giving notice to the engineer by means of a pyrometer placed inside the pipe, when, in consequence of the gases taking fire in the uptake, the steam becomes too highly superheated, and as a consequence, the valves, pistons, and cylinders are liable to damage, the pyrometer being arranged to act upon the whistle at all times when the temperature of the steam rises above 340°. By the same means a throttle valve is made to shut off the superheated steam and open a direct communication between the boiler and the engine.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, December 1.—N° 3158.

RAMSBOTTOM, JOHN.—This invention relates to compound steam engines, and to steam generating furnaces.

Steam engine :—Two small high pressure cylinders are placed, *one on each side* of the main cylinder of an ordinary beam engine.

The three cylinders correspond in length of stroke, and the three piston rods are attached to one cross head, which is coupled to the swing links of the beam. A horizontal cylindrical valve case is fitted across the three cylinders so as to correspond with each by means of a triple valve, arranged to receive and convey steam, first to the two small cylinders, and thence to the large cylinder, where it is used expansively. When applied to direct-acting or horizontal engines, the engine bed is made hollow, and serves as a condenser, beneath which is the hot well, which receives the discharge from an oscillating air pump in communication with the condenser, which pump is constructed according to a former Patent, dated December 21, 1864, No. 3171.

Boiler :—" In front of an ordinary single or double flued boiler,
" and projecting from a hinged door to be fixed thereon, are
" bearings to support a swing plate closed at the sides; below
" this plate and extending into the interior of the flue are inclined
" grate bars having transverse supports at their extremities; near
" this swing plate is a shaft carrying three cams and two rods;
" these rods are successively moved by the cams, and as each
" rod is connected with each alternate grate bar the motion is
" successively transmitted to them; the third cam imparts motion
" to the swing plate, which motion is intended to crush the fuel
" supplied betwixt it and the door, as well as to distribute such
" fuel suitably on the inclined grate surface; the motion is imparted
" to the grate bars to prevent the formation of clinkers or
" other matters pernicious to a free supply of air. At the
" extremity of the grate surface and behind the bridge is a
" deflecting surface intending to divert the escaping gases in the
" the direction of an adjustable air admission valve to supplement
" the quantity of air necessary to effect the combustion of
" the gases more thoroughly."

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1866, December 1.—N° 3165.

BROWNING, Samuel John.—This invention relates to applying and arranging apparatus employed for evaporating and distilling water, and to combining and adapting such apparatus to various kinds of existing galleys or cooking apparatus, and also to the different descriptions of heating or warming apparatus employed on board seagoing ships. " Instead of constructing [illegible] in the usual manner. I place above [illegible] or between the fire and the flue [illegible] above deck or above the 'cook house,' [illegible] box, case, or other vessel of any suitable [illegible] that the heat or flame and products of [illegible] from the fire act upon one or other side of the series [illegible] contained therein for the purpose of heating the salt [illegible] contact with the other or contrary side of such tubes, [illegible] to say, that when the salt water circulates within the [illegible] the heat is applied externally, and when the heat is caused to pass through the interior of the tubes salt water will be in contact with the exterior of such tubes, and thus the heat which would otherwise pass up the flue or chimney is utilised for the purpose of generating steam from salt water, to be afterwards condensed by any of the ordinary steam cooling or condensing apparatus. By interposing a vessel containing tubes between the hot plate or cover of a cooking stove of the ordinary construction and the pipe or chimney I am enabled to place the ordinary fresh water heater or boiler behind it, so as to form a flue and hot chamber, by which the flame and products of combustion are further detained and caused to remain in contact with the metallic heat-abstracting surfaces, so as impart as much of the remaining heat thereto as may be available or useful; for this purpose I split or divide the flue into suitable parts or passages, so as to prolong the circulation of the heated products of combustion."

The constructive details of the apparatus are varied in accordance with its intended application or uses, such as distilling sea water, heating ships' cabins and places, generating high pressure steam to work a donkey engine on board ship, and heating water for culinary and other purposes.

[Printed, 8*d*. Drawing.]

A.D. 1866, December 3.—N° 3179.

COFFEY, John Ambrose.—This invention relates to heating and cooling fluids, and generating steam; it is stated to be especially useful in dry destructive distillations, and also for evaporating and refrigerating processes. Within a heating furnace, is contained a coiled or otherwise closely packed arrangement *of tubing*, formed in sections one above another, and so united, that all through from the lower to the upper end, there is one continuous passage. The steam generator or evaporator is a vertical cylindrical vessel closed by a hemispherical steam chamber or cover. Within the body of this vessel is contained a series of narrow concentric cells, in communication, by means of pipes, with the upper and lower ends of the system of heating tubes. The annular interspaces between the cells are filled with water or liquor, and the cells contain heated quicksilver or molten metal, supplied from the heating tubes in the furnace, and kept when necessary in circulation therewith, by a force pump or other suitable means. The hemispherical top of the generator forms a steam chamber, which communicates with the steam engine, or otherwise according to the adaptation of the apparatus. At a suitable height above the furnace, and communicating with the heating pipes, there is a reservoir for the liquid metal, the supply of which is regulated by a three way cock.

When in use for refrigerating, the furnace is dispensed with, and the endless series of pipes, through which is driven a constant stream of cold water or air, is surrounded with ice or other cooling medium.

When used for dry distillation, the generator is dispensed with, and a suitable vessel containing concentric cells, a receptacle for nut galls or other substance for sublimation, and the usual trays is substituted. Arrangements to meet other requirements are described.

[Printed, 8*d*. Drawing.]

A.D. 1866, December 5.—N° 3197.

BRIDGES, Thomas, and BIGWOOD, Joshua.—This invention, relating to steam boiler and other furnaces, consists (1st) in introducing jets of heated air at the furnace door, and (2nd) introducing jets of heated air at the bridge. The furnace door is made hollow in the form of a box, inclosed back and front with perforated plates, into which are set short tubes which form air passages through the door into the furnace, and also communicate with the interior of the door by means of lateral perforations in the tubes. A sliding plate, perforated to correspond with the ends of the tubes, is fitted outside to the front of the door, and when operated by means of a lever, is made to regulate the air draught through the door, the back plate of which, in addition to the tube openings is otherwise perforated for the passage of the air, which passes into the door through the lateral openings in the tubes. The door is heated by radiation from the fire, and the air which passes takes up this heat and carries it in jets into the furnace. Instead of a hollow door, a movable box may be arranged to heat the air draught inside the mouth of the furnace.

The furnace bridge is made hollow and covered by a curved perforated plate; communicating with the ash-pit there is an opening in the lower part of the bridge for the admission of air, which is regulated by a slide. The air on its passage is made to pass through perforated plates fixed in the bridge, whereby the temperature of the current will be raised, and the combustion of the gases more effectually promoted thereby. The invention must be modified to suit varied constructive arrangements.

[Printed, 1*s*. Drawing.]

A.D. 1866, December 5.—N° 3206. (* *)

BARWICK, JAMES, and TINDALL, SAMUEL.—" Improve-" ments in packing for the piston rods of steam engines, and of " pumps for raising or forcing hot fluids, acids, and other cor-" rosive matters, which improvements are also applicable to the " packing of the stuffing boxes or glands of the spindles or " axes of cocks or valves used for the passage of steam, hot " fluids, or acids."

" The improvements relate to the use of hard india-rubber, " such as that commonly called ebonite or vulcanite, mixed with " oil or grease . . . . In applying the mixture thus obtained " we according to one method first bind round the piston rod or " other spindle in the stuffing box or gland, a small quantity of " gaskin or spun yarn, or other suitable fibrous matter; upon " the we apply a layer of the mixture, then a layer of tow or " other fibrous substance, then another layer of the mixture, " and then another layer of the tow or other fibrous substance, " and so on until the desired quantity of packing has been " obtained . . . . According to another method we form tubes " or cases of coarse linen or other suitable material, which we " fill with the mixture, and such tubing so filled we apply in " the glands or other packing in coils rammed tight around the " piston rod or other spindle, to be held there in position by the " cap of the gland or other packing."

[Printed, 4d. No Drawings.]

A.D. 1866, December 5.—N° 3207.

CLARK, William.—(*A communication from Auguste Gerin.*)—This invention relates to rotary engines, in which the expansive force of steam or gas is utilized, by combining the rectilinear motion of sixteen or other number of pistons, working in a series of cylinders, circumposed at an angle with the radius, round a wheel, which is fixed upon a horizontal shaft mounted in suitable bearings. The pistons are diametrically united in pairs by metal bands, which pass over guide rollers, and as the wheel rotates and the cylinders in succession cross the vertical plane of the axis, steam is admitted to the bottom of the cylinders under the pistons, which by turns are successively driven obliquely upwards on the outward stroke, drawing upwards for the inward stroke the piston on the opposite side of the axis, to which by means of the metal band it is attached. The steam is only admitted to the cylinders respectively once in a revolution, and that for the purpose of performing the outward stroke at the moment the cylinders in succession pass the vertical line over the axis. In this way all the pistons are at the extremity of the outward stroke on the descending side of the wheel, and all, while on the ascending side, are lifted or drawn towards the centre or axis, and it is the difference in the weight of leverage, produced by the position of the pistons in relation to the fulcrum or axis, that causes rotary motion. The steam chest, which is capable of adjustment, is fixed to slide against the revolving surface of the wheel, in such a position, that the induction inlets into the bottom of the cylinders, in succession pass over the outlet from the steam chest, at the proper moment to effect the successive lifting or outward stroke of the pistons.

[Printed, 8*d*. Drawings.]

A.D. 1866, December 11.—N° 3259.

NEWTON, William Edward. — (*A communication from Edouard Victor Jules Joublin.*)—This invention relates to "apparatus for cleaning the outer surfaces of boiler tubes" and consists of a chain, the links of which are furnished with pointed projections, to act as scrapers, which, when the chain is moved backwards and forwards round or across the tubes, and at the same time is shifted along them, come upon their incrusted or foul surfaces, and scrape off the accumulated matter deposited thereon. "These chains may either be made straight or in what "the inventor calls a 'helicoidal' form, that is in gradations or "or steps, or with each link or set of links higher or lower than "the preceding or succeeding ones, so as the more readily to "cover the surface of the tube when wound round it." Chains composed of links variously formed are described, as also different modes of applying them. The use of cast steel or case hardened iron or by preference hammered steel is recommended as most suitable for the manufacture of the links.

[Printed, 1*s*. Drawings.]

A.D. 1866, December 12.—No. 3262.

BOYMAN, Richard Boyman.—This invention relates to the propulsion, by means of jets of high-pressure steam, of sea-going vessels and aerial conveyances.

In regard to marine navigation; a set of the apparatus is so affixed at both sides to the bilge of the vessel below the water line, that when fair winds prevail and the ship is running under canvass alone, each set can by means of a pair of steam donkey engines, be converged or drawn within the contour lines of the ship, so that under such circumstances they may not by dragging against the water, impede or obstruct the vessels progress. The power or impulsive force of the steam is directed upon the water through suitable pipes, which pass out at each side of the vessel. The apparatus consists of a horizontal rectangular tube or case, permanently fitted to each side of the vessel, and to each tube are fitted two movable mouth-pieces, one at the fore end for driving ahead, and the other at the after end of each case for backing astern. These mouth-pieces are connected to the steam pipes, and consist of a series of bell-mouthed tubes or frustums of progressive sizes, concentrically arranged one a short distance within another. The extreme ends of the steam pipes are bent round to a right angle, so as to direct the full impulsive force of the steam jet into the central or smallest frustum, whereby (it is stated) a current of water is induced to enter, and is forced through the horizontal case, which by reacting in proportion to its velocity upon the water at the after end of the case, causes the propulsion of the vessel. The steam pipes are fitted upon the telescopic slide principle, so that when going ahead, the mouth-piece which effects the stern movement may be drawn within the vessel. Provision for preventing the condensation of the steam in the pipes, is made by incasing and filling the interspace with sawdust, but how far the sudden contact of the steam with the cold sea water will effect the velocity and impulsive force of the jets, appears to have been overlooked.

An improvement is made in the manner of contracting or converging, by means of cams, the floats of a marine propelling wheel, described in the Specification of prior letters patent, granted to this inventor and dated May 29th, 1866, No. 1496, and his other letters patent dated May 10th 1860, No. 1155, are referred to.

With regard to aerial navigation, the "gaseous envelope," unlike the ordinary pear-shaped balloon, is a horizontal cylindrical shell, 195 feet in diameter tapering conically to a point at each end, the whole length being about 1300 feet. This shell is to be formed of thin sheet steel, aluminium, bronze, or other suitable material, strengthened to maintain its form and withstand internal pressure, by numbers of metal rods, hoops, and stays. An inclosed platform, longitudinally depending from the central part or cylindrical section, supports saloon accommodation for 200 passengers, and a boiler house containing four multitubular steam generators, which are heated by the flames of numerous jets of gas supplied from the "gaseous envelope;" the water for a limited consumption being carried in cylindrical casings or jackets, with which the boilers are enveloped. The steam generated is caused to issue against the atmosphere through four adjustable jet pipes, two on each side of the platform, in the direction contrary to the intended movement or course of the aerial machine, which is moved forward by the reactive resistance of the air. The Specification contains a large amount of mathematical and dynamical formulæ, whence the inventor deduces sufficient to give him confidence in the ultimate success of his invention.

[Printed, 4*s.* 10*d.* Drawings.]

A.D. 1866, December 12.—No. 3267.

ROBINSON, JOHN, and SMITH, JOHN.—(*Provisional protection only.*)—This invention which relates to the application of motive power from steam or air engines, to saw frames, consists,—

1st. Is so arranging the working of the slide valves of the steam or air cylinder, that, by allowing sufficient lead, the induction passages open across the piston at the termination of the stroke, thereby providing a medium for the piston to cushion against.

2nd. Relates to the mode of giving motion to the valves. A link is employed, one end of which is connected to the saw frame, and the other is slotted and adapted to slide on an adjustable centre pin, which determines the length of motion. Joined to this link is another, which is connected to an arm turning upon a fixed centre, and carrying the valve rod. By these means, the up and down motions of the saw frame and adjustable pin, are caused to operate the valves.

3rd. Relates to another mode of working the valves, by means of inclining adjustable tappets, attached to the saw frame so as to act upon rollers, and cause a shaft or lever to oscillate and impart the requisite sliding motions to the valve. The latter arrangement may be modified.

[Printed, 4d. No Drawings.]

A.D. 1866, December 13.—Nº 3272.

HEYNS, Patrick.—(*Provisional protection only.*)—This invention relates to the construction of steam boilers, the object being to obtain additional strength, facilitate the generation of steam, and ensure greater safety. It consists 1stly, in the use of plates suitable in form and dimensions to suit the size and shape of the boiler; each one of such plates being made concave on the outside, the other side which is turned to the inside of the boiler being convex. 2ndly, consists in the use of a float so connected to a piston in an inverted syphon tube which leads into the furnace, that when the water in the boiler falls below a certain level, the corresponding subsidence of the float operates the piston so as to open a valve in the syphon tube, wherethrough the water then escapes into the furnace and extinguishes the fire. This part of the invention is applicable to all boilers.

[Printed, 4d. No Drawings.]

A.D. 1866, December 13.—Nº 3279.

RIPLEY, Henry William, and **BARKER**, Thomas.—This invention relates to furnaces for steam boilers, and is more particularly applicable to those boilers which are constructed with internal flues. The upper part and sides of the furnace are inclosed or covered by a wagon-shaped casing, which contains water space in communication (by means of pipes) with the water in the boiler, and in transverse section is crescent formed. In length and breadth it is sufficient to cover one of "Jukes'," revolving furnace grates, forming a low arched fire chamber above the fire-bed. Any other kind of movable grate bars may be employed, including one which constitutes a part of this invention, and comprises a transverse series of horizontal rotating shafts, whereon, packed a short distance apart, and ranged from end to end on each shaft, is a series of metal discs, each disc in thickness about equal to the substance of a fire-bar. The peripheries of these discs on the several shafts, when the latter are mounted on their bearings, which are placed at intervals along the sides of the furnace frame, are sufficiently contiguous to prevent the fire falling through, and they form the furnace grating with an undulating surface. Fixed upon the end of each shaft is a worm wheel, to which a constant rotative movement is imparted and through them to the transverse shafts and discs, by means of a series of worms fixed at corresponding intervals upon a longitudinal shaft, which obtains motion in the front of the furnace from the moving machinery, by means of a strap pulley. The furnace frame being mounted upon wheels which rest upon foundation rails, may be withdrawn from the furnace, to which the fuel is fed in regulated quantity by means of a hopper.

[Printed, 10*d*. Drawing.]

A.D. 1866, December 14.—N° 3289.

NEWTON, ALFRED VINCENT.—(*A communication from Samuel Harris.*)—This invention relates to a steam motor. Horizontally mounted in a right line upon bearings fixed upon a rigid foundation, are two shafts; each shaft rests upon two bearings; one shaft is tubular and the other solid. Upon the contiguous end of the latter is fixed a disc, which carries round it, projecting from one side, a broad cylindrical rim, forming a cylindrical box, wherein the contiguous end of the hollow shaft or axis terminates and carries, extending diametrally on each side the axis, a pair of tubular arms, the extreme ends of which are bent in opposite *directions*. The interior of the rim is furnished all round with a series of buckets, which receive the impact of the steam, and which is so directed into them in succession from the bended ends of the hollow arms, that the disc is impelled by the force of the steam, thereby causing the solid shaft to rotate in one direction, whilst the reaction on the tubular arms, causes the hollow shaft to turn the opposite way. The apparatus is surrounded by a casing, whence the steam after use escapes by a waste pipe, as also the water of condensation, which runs off by means of an outflow pipe at the bottom of the apparatus.

[Printed, 8*d*. Drawing.]

A.D. 1866, December 17.—N° 3309. (* *)

HAUWORTH, John.—(*Provisional protection only.*)—" Im-" provements in steam boiler and other furnaces."

In order to consume the smoke the furnace is built projecting in front of the boiler and somewhat higher than the top of the flue. The bars extend both inside and outside the front of the boiler. The top of the furnace outside the boiler is left open for supplying the fuel, and the front is provided with apertures extending across its front for admitting air and for stoking. Air is also admitted between the grate bars, but none enters through the open top of the furnace, the fuel being heaped on to prevent it. The top of the furnace may be provided with a hopper for the same purpose. At the back arranged openly is a number of fire-bricks; these extend from the grate bars to the top of the flue or otherwise, and between them the products of combustion pass. The bridge is placed near the back end of the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 18.—N° 3321.

GRAY, John McFarlane.—This invention relates to a steering telegraph and rudder indicator, and to a steam steering engine.

The telegraph and indicator, which heretofore have been operated by separate connections, are constructed to form one machine, the object being, a telegraph applicable to steering by steam power, and yet possessing all the necessary requirements for steering by hand. Visible and also audible communications, between the station on the bridge and the man at the helm, are effected by means of light shafting, suitably arranged so as conveniently to reach the two points. The visible indications are shown on a dial by means of fingers pointing from the same centre, one finger showing the actual position of the rudder, and the other the desired alteration in the course of the ship. The audible indications are given by means of bells.

The steering engine is placed at the stern, and is entirely under the control of the man on the bridge. It is adapted to keep the rudder in the required position, or to restore it to that position against the contrary action of the sea, and its movements are regulated by means of connections with the telegraph gear. It consists of two cylinders, having the usual ports fitted with equilibrium cylindrical valves, and a special valve for reversing the direction of motion. It is capable of being thrown out of gear with the telegraph mechanism, and will work a windlass when not otherwise employed. The steam steering engine, and the telegraphic and steering apparatus described and illustrated, are employed on board the " Great Eastern " steamship. Modifications of the steering telegraph and rudder indicator are shown.

[Printed, 2*s.* 8*d.* Drawings.]

A.D. 1866, December 20.—3345.

GRAHAM, DAVID ALLAN. — (*Provisional protection only.*) — This is an invention which relates to steam and water traps, containing an equilibrium discharge valve, operated by a spherical float. The trap case inclosing the valve and float, may be spherical or of any other convenient cylindrical form, cast in halves and with a lateral flange, for the purpose of bolting to a wall or otherwise, at such a level that the water of condensation to be discharged from the steam pipes, cylinders, or conduits, may freely flow through the trap, which internally is only slightly larger in diameter than the float. The bottom of the float is connected to the outlet valve, the seating for which is fitted centrally in the bottom of the trap case, and in the centre of the top of the trap case, fitted steam-tight in a vertical socket directly in a vertical line over the centre of the valve, is a small piston, which counterbalances the pressure on and is connected to the valve by a vertical tube, which is also connected to and passes centrally through the float, the area of the piston corresponding with the area of the valve. As the water flows into and accumulates in the trap case, the steam pressure on the valve being counterbalanced by the pressure on the piston, admits of the valve being opened by the rising of the float, which sinks again with the level of the water as the latter is discharged, and closes the valve before any escape of steam can take place.

Modifications adapted to various other purposes are described.

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 21.—Nº 3371.

CLARK, William.—(*A communication from Claude Moret and Felix Raux.*)—This is an apparatus for producing draught in furnaces, and for purifying the smoke. It consists of a reservoir or closed chamber formed of metal, masonry, or otherwise, in size proportionate to the amount of smoke to be intercepted, and having two compartments and two sets of suction or delivery valves respectively for the inlet and outlet of the gases and smoke. Upon this reservoir, so that each shall cover a suction and a delivery valve, are mounted two vertical cylinders, open at the top and surrounded by a casing to form a narrow annular space for water, wherein, dipping air-tight into the water are two inverted cylindrical trunks. These trunks are closed at the top, and alternately are caused to work up and down in the water space by means of suitable connections attached respectively thereto and to the ends of an oscillating beam, which obtains motion from a steam engine or otherwise. By this means a constant stream of smoke is passed through the chamber, the two compartments of which are respectively connected, one (the inlet) with the furnace flue, and the other with a receiver, which is a square shallow vessel containing water, and having a circular grating at top. Vertically fixed upon the top of the receiver, so as to inclose the grating, is the purifying cylinder, which is filled with coke broken in small pieces, and has an outlet at the top. The coke is kept in a moist or wetted state by means of a perforated pipe coiled inside round the top of the purifier, and a pipe is provided to drain the water to the level of the grating.

The apparatus produces an artificial draught, and the products of combustion drawn from the furnace by the inverted trunk *cylinders* and forced through the water in the receiver, are purified whilst passing up through the wet coke, and have, when issuing from the top of the purifier, the appearance of white vapour; they may be condensed by refrigeration.

[Printed, 8*d*. Drawing.]

A.D. 1866, December 24.—N° 3390.

LEWIS, Richard.—This invention relates to the construction of rectangular steam boilers, internally furnished with a series of narrow vertical flue sections, transversely disposed in the water space above the furnace or furnaces, which also are inclosed by water space that descends and forms the sides of the ash-pit, curving inwards towards the bottom. The boilers as suited to marine purposes are short. The furnaces extend towards the back, which at the lowest part is faced with fire brick, inclining upwards and directing the flaming products of combustion into a vertical flue or chamber, which turns at the top in the direction of the front of the boiler, and forms a communication with the backmost vertical flue section. These vertical flue sections are alternately connected top and bottom by hemispherical bends or hollow arched junctions, having the same internal area as the flue sections, which are thereby united, so as to form one continuous undulating flue from the back of the boiler, over the furnace to the uptake in front, where the hot draughts, after coursing alternately up and down in the passage through the combined series, pass off to the chimney. Short vertical pipes, which are exposed inside the flue to the passing heat, are fitted at their ends into the plates which form the arched junctions, and open communications for the circulation of the water and rising steam from below to above the flue, and openings are provided for cleaning the sooty and cinerary deposits out of the inverted arches which form the bottom junctions.

A vertical group of superheating pipes contained in a closed chamber is disposed in the uptake.

Modified arrangements are illustrated and described.

[Printed, 1*s*. Drawings.]

A.D. 1866, December 28.—N° 3404.

WALKER, Thomas, and WALKER, Thomas Ferdinand.—(*Provisional protection only.*) — This invention, relating to apparatus for regulating the evaporating power and safety of steam boilers, consists in the employment of an inner cylinder or tube, which is open to either the steam or water space of the boiler, and of an outer cylinder, which is closed at one end and internally packed round the other, so that it will slide steam-tight upon the inner cylinder, where it rests weighted to the ordinary boiler pressure. A number of weights or springs are so disposed at intervals above this outer cylinder, that as the cylinder is raised by excess of steam pressure, the weights are taken up in succession according to the amount of the progressive increased pressure and upward movement. The cylinder is so connected by suitable means with the flue damper, that when the cylinder is raised by excess of pressure, the damper is correspondingly closed. A connection is also made between the cylinder and the boiler float, whereby, when a deficiency of water exists in the boiler, and the float sinks to the verge of danger, a valve by means of a lever is opened, so as to admit water into the furnace to quench or put out the fire.

[Printed, *4d.* No Drawings.]

A.D. 1866, December 28.—N° 3405.

CLARK, WILLIAM.—(*A communication from Samuel Joseph Peet.*) —This invention relating to the construction of valves for closing and opening steam and other fluid ways, consists in the use of two discs, disposed a short distance apart, back to back in the valve case; the fluid ways are opposite the outer faces of the discs, and each way is surrounded with a flat seating. Projections on the back of one disc fit into cavities in the back of the other, and keep them in relative position, the outer face of each disc being a plane surface. The lower end of the valve spindle, which screws down the spindle socket, is furnished with a conical wedge fitting into a correspondingly formed cavity recessed partly in the back of one disc and partly in the other. When the discs are raised by the spindle, they are relieved from the divergent pressure of the conical wedge, and slide easily off their respective seatings, leaving a direct passage for the fluid; and when the spindle is screwed down in order to close the fluid ways, the disc faces when opposite their seatings are pressed divergently by the action of the conical wedge, and both ways are simultaneously closed, the two discs acting as a *double* valve.

[*Printed, 8d.* Drawings.]

A.D. 1866, December 28.—N° 3406.

MAKINSON, **Alexander Woodlands.**—The object of this invention, which relates to locomotive and marine engines, is to reduce the amount of slip of driving wheels and paddle wheels, by bringing when starting, auxiliary tractive effort in excess of the traction or power required for continued working. As applied to locomotive engines, at the side of each driving wheel, and somewhat less in diameter, is fixed upon the main axle a friction wheel, running round the periphery of which, is formed a series of deep grooves; correspondingly grooved round, are two pinions fixed upon a transverse shaft, so that their grooves shall rest in the grooves round the large wheels. Upon the extreme ends of this shaft there are, mounted on each side of the engine, other large wheels, grooved like the others, and other grooved pinions upon another transverse shaft, which is about level with the top of the boiler. These shafts are carried by bracket frames or bearings, mounted upon the side frames of the engine. Upon the upper transverse shaft is fixed a disc, to which are attached pipes radiating from a hollow steam chamber formed round the shaft. The ends of these radiating steam pipes are all bent in one direction, so that the steam jet issuing from each against the atmosphere and a surrounding casing, causes the shaft to rotate. The large grooved wheels are set in motion by the friction of the pinions, and in this manner it is proposed to assist the driving wheels, and prevent the slip at starting. Arrangements are made for lifting the wheels out of action, and for regulating the transmission of steam. The casing is intended to act as a condenser.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, December 28.—N° 3407.

STOREY, **Edward.**—(*Provisional protection only.*)—This invention relates to steam boilers, and consists in surrounding the boilers with a double casing, so as to form two distinct circumvesting chambers. The feed water flows into the outer chamber where it is heated by the hot draughts, which, after passing through the boiler flues, are made to course through the chambered space between the inner casing and the boiler before passing on to the chimney. By these means the feed water is heated in the outer case whence it is pumped into the boiler. The outer casing, unless required to do so, need not be constructed to bear pressure.

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 28.—N° 3409.

CUTLER, WILLIAM HENRY, and BROWN, THOMAS.—(*Provisional protection only.*)—This invention relates to the construction of a valve cock for stopping and regulating the flow of steam, water, and other fluids. The valve seating is either formed cup-shaped and the valve face flat, or the seating is flat and the valve face cup-shaped, so that the flat surface of one sets upon the annular raised rim of the other. The valve face, according to the purpose for which it is designed, may be metal, wood, india-rubber, or other material, fixed on one end of the valve spindle, the other end being screw threaded is provided with a handle, and fitted to work through a corresponding tappet or threaded hole in the end of the case, which may, if required, be fitted with a suitable stuffing box, the valve face being transverse to the spindle length. When used to stop the flow of high pressure steam or other fluid, "it may be so constructed as to be either "wholly or partially opened or closed by the said pressure." The form of the face of the valve seat is modified to suit the particular material used in its construction.

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 29.—N° 3416.

SMITH, SAMUEL, and JACKSON, JOHN WILLIAM.—This invention, relating to governors for regulating steam and other engines, is supplemental to Letters Patent, bearing date April 7, 1865, No. 991, previously granted to these inventors. The present invention provides means for the prevention of the too sudden rise and fall of the governor balls upon the parabolic arms of the governor when any variation in the speed of the engine takes place, which, according to the said prior invention, was found to be the case. The means employed consist in jointing the upper end of the rod of a small piston to the connecting rod which transmits motion from the governor to the throttle valve. The piston works loosely in a small cylinder filled with oil or other fluid slow to evaporate. As long as the ordinary uniform speed be maintained but little resistance is offered to any slight rising or falling of the balls, which takes place as usual; but should any sudden acceleration of speed occur, the corresponding entire effect cannot be simultaneously exercised upon the throttle valve, because the liquid in the cylinder retards the motion of the piston in either direction, which can only rise and fall in accordance with the speed of the displacement of the liquid then taking place all round between the periphery of the loosely fitting piston and the cylinder sides. By these means the effect of a sudden change of speed is slowly communicated to the throttle valve. A spiral spring mounted upon the small piston rod is employed to moderate the resistance.

[Printed, 8*d*. Drawing.]

A.D. 1866, December 29.—N° 3421.

SIMONS, William, and BROWN, Andrew.—This invention relates to arranging and constructing steam dredging machinery, and consists,—

1st. In combining within one vessel the steam power and dredging machinery, and the cavity or hopper for receiving the dredged material, which heretofore was discharged by the dredging buckets into a separate vessel or hopper barge. The hull of the vessel is built with a central narrow well of sufficient length to accommodate the bucket ladder, which is of the ordinary construction, the delivery end being raised above deck on appropriate framework, to which it is attached by a suitable joint. The other end of the bucket ladder is free, and can be raised into the well above the level of the keel, or lowered to dredge at the bottom by means of blocks and chains. The hopper or hold into which the material is discharged from the buckets by means of a shoot which overhangs, occupies the full breadth of the vessel, and in length all the available space between the after end of the well and the boiler and engine room, which is arranged towards the stern. When the hopper is full the power shaft is thrown out of the gear of the dredging machinery, and into gear with the shaft of a screw propeller, whereby the vessel is enabled to proceed direct to a convenient place, where she can, by opening swing flaps or doors which constitute the bottom of the hopper section, discharge the dredged material without delay. When the contents have sunk out of the hopper, the doors are raised and closed by means of chains.

2nd. Relates to a dredging boat, which is also capable of excavating operations. The chain of buckets on the ladder is projected over the stem or bows of the vessel, so as to be conveniently disposed for removing and under-cutting the soil or material of the bank or earthy margin of the river, canal, or work, above the water level; and when the superincumbent mass falls it is dredged up in the usual way, the free end of the bucket ladder being lowered to the required depth.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, December 29.—N° 3424. (* *)

HARRISON, CHARLES.—" Improvements in cocks or valves."

" I make the plug of each cock or valve hollow with a transverse " bridge or stop in the middle, and form screws when required " at each extreme end of the plug for uniting it to the pipes of " supply and discharge. At each side of the bridge I make two " apertures opposite each other, and fit on the plug a barrel " having two opposite chambers, each opening over the bridge " with their edges agreeing with the apertures in the plug, and " when required the barrel and chambers are in connection with " a disc or handle wheel. The pipes of supply and discharge are " always open to the ends of the plug, and when the barrel is in " such a position that the chambers are full open to the apertures " there is a free passage through the cock or valve, but when the " barrel is turned so as to place the openings of the chambers on " the plain part of the plug between the apertures the passage is " entirely closed, and all areas of passage between the full open " and entirely closed are regulated by turning the barrel and " causing the chambers to be more or less open to the apertures " in the plug."

[Printed, 10*d*. Drawing.]

A.D. 1866, December 31.—N° 3452.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from George Herman Babcock and Stephen Wilcox, junior.*)—This is an invention for effecting the cut-off in steam engines, and regulating and controlling their speed.

The cut-off valves are operated by the piston of a small auxiliary cylinder which rides upon the main valve, and acts *independently* of the mechanism connected therewith, the main valve being operated in the usual way by an eccentric on the engine shaft. The cut-off valves have their seatings on the back of the main valve, through which, to correspond with the cylinder ports, morticed openings are cut, and there is a recess in the face of the valve for the passage of the exhaust. The valve which admits steam to the small cylinder, is worked in a transverse direction to the axis of the cylinder by a rod, which enters the side of the steam chest through a stuffing box; this rod is actuated by an eccentric or crank capable of moving on a shaft in connection with the governor. This shaft as regards time, revolves coincident with the engine shaft and the eccentric which operates the main valve, and according to the lead given to the valve of the auxiliary cylinder, so will the cut-off be regulated.

Two modifications of governing apparatus for regulating the action of the cut-off and consequently the speed of the engine are described, and appropriate formulæ appended to assist in their construction, the object being to cause the gyrating balls whilst diverging by centrifugal force, to move on one horizontal plane instead of rising to higher planes when driven with increased speed, the resulting effect being that the gravity of the balls whatever their position is reduced to a constant quantity.

[Printed, 1*s*. 6*d*. Drawings.]

SUPPLEMENT.

A.D. 1860, January 18.—N° 130.

HEWITSON, William Watson, and WALKER, Benjamin.—This invention relates to mechanical arrangements and self-acting appliances for working the valves of steam hammers, whereby their speed and action may be immediately adjusted to perform either light or heavy work. The motion for the valve is obtained by the use of a bell-crank lever, which centres freely on a fixed stud attached to the frame. The extreme end of the horizontal arm of this lever is carried up and down by a swivelling socket attached to the hammer block. The short vertical end of the lever carries a fixed stud, whereon is a roller, which works in an adjustable cam slot formed by two quadrants suspended from the weighted end of a horizontal lever, which moves freely on a stud fixed to project from the framing, its other end being connected to the valve spindle. The upper part of one quadrant, and the lower part of the other are by means of links respectively connected to horizontal slides which, for the purpose of adjustment, are severally moved to and fro in their guides by means of hand wheels mounted on screws. By these means, according to the relative positions given to the two quadrants, the form of the cam slot is changed, whereby the required adjustment is imparted to the valve.

[Printed, 1*s*. Drawings.]

A.D 1860, January 28.—N° 223.

JOHNSON, John Henry.—(*A communication from Edouard Francois Fossey.*)—This invention relates to the valvular arrangements of blowing engines, in which "the objectionable use of " clack or slide valves is obviated . . . by the application to " each end of the blast cylinder of a rotating disc or outer cover, " provided with alternate radiating openings and closed channels " *or air* passages. These discs rotate in contact with the fixed

" ends of the cylinder, which have a number of radiating openings made in them corresponding to the openings in the rotating " discs, so that when the two sets of openings coincide, as they " will intermittently do during the continued rotation of the " discs, there will be a free communication between that end of " the cylinder and the atmosphere, whilst the disc on the opposite " end of the cylinder is so timed in its rotation that its air " channels will be over the openings in the fixed end of the " cylinder. These channels when in this position form a communication from the interior of the cylinder to an annular " chamber which surrounds the cylinder, and communicates with " the main blast pipe. The discs are rotated by gearing so proportioned in relation to the stroke of the piston that the end of " the cylinder from which the piston is receding will be open to " the atmosphere, and consequently air will be drawn therein, " whilst the end towards which the piston is approaching will be " in communication by means of the radiating air channels with " the annular space leading to the blast pipe. The piston may " be actuated direct from a steam cylinder, or from a crank shaft, " driven either by a strap and pulley, or by the piston rod of a " steam engine."

[Printed, 10*d.* Drawing.]

A.D. 1860, February 29.—N° 561.

SMYTHIES, John Kinnersley.—This is an invention of a flying engine to be actuated by steam power.

"A tubular or a 'Hancock's' boiler, with the tubes or other " passages for heated air as numerous and small as possible, " and heated by the combustion of oil or some liquid fuel injected " into the furnace of the boiler in vapour, so as to admit of an " extreme subdivision of the heating air and heated water without " clogging the minute air passages, has attached to each side a " sector cylinder, which is a steam chamber wherein the piston " turning round a fixed axis oscillates like a door on its hinge by " an arrangement of valves similar to that of other steam engines. " The prolongation of each piston's axis is a rocking shaft turning " round at each oscillation of the piston through the same angle. " On each shaft is fixed a wing, so that piston shaft and wing " form one solid, on which the steam acts directly to flap the " wings. Each wing is formed of pieces, the number not being

" essential, which I call feathers. Each feather consists of a " long tapering, flexible, and elastic rod of steel, whose base is " fixed firmly on the rocking shaft, and whose apex is fixed to a " wire, whose other end is so fixed to the shaft as to bend the " rod. The surface between the rod and wire is covered with silk " or thin sheets of gutta percha. Each successive feather from " the front backwards slightly overlaps the preceding, so that " every feather but the last is supported against the air's resistance " in the down stroke by the rod of the next feather overlapping " its wire, and the whole descends as one entire surface. The " last feather is bent by the air's resistance into an oblique position, which gives a forward impulse, while the rest gives an " upward one. In the wing's upward stroke, the feathers not " supporting each other fly apart, and assume that oblique position which causes nearly the least resistance to the air, and a " slight forward impulse. Wings like those of bats may also be " used. A seat for the rider is fixed to the boiler between the " wings, so that he can by slightly inclining his body throw " the centre of gravity of the engine and himself together behind " the line joining the middle of the pistons, when he will ascend, " or before it, when he will descend, or nearer to one wing than " the other, when he will turn to the side of that wing which he " approaches. . . . To alight gently, the engine should have " an expanded tail of silk on a light frame and long elastic legs, " and for long flights a condenser, to diminish the weight of " water carried."

[Printed, 2*s.* 4*d.* Drawings.]

A.D. 1860, March 7.—N° 625.

IMRAY, John, and COPELAND, James.—This invention relates to " steam and other hammers and anvils," which are so arranged " that their position is adjusted by hydraulic pressure, " and the force of the blows given and received by them transmitted through fluid."

The anvil block is " mounted on the ram of a hydraulic cylinder containing water, oil, or other suitable liquid, and communicating with a pump or an elevated cistern or reservoir " under pressure, the communication being regulated by cocks or " valves, so that the liquid can be admitted into the cylinder to " raise the ram and anvil block, or discharged from the cylinder " to lower them."

The hammer, "whether worked by steam or other power, is "made in two parts, one a cylinder containing liquid, and the "other a ram fitted to the cylinder, so that when one part gives "the blow the other part is subjected to diffused fluid pressure, "instead of the shock resulting from solid connection of parts."

The steam hammer "cylinder is mounted on a frame, and fitted "with a piston having a heavy rod passing through a gland and "guide at the bottom of the cylinder. The lower end of the rod "is fitted with a hydraulic hammer . . . , or with a shoe for "striking the forging placed on a hydraulic or other anvil below. "The parts leading to the top and bottom of the cylinder com"municate with a cylindrical or other slide valve worked by a "hand lever or other convenient means. When the slide is "moved in one direction steam is admitted under the piston, and "permitted to escape from above the piston so as to raise it, "and when the slide is moved in the opposite direction the supply "of steam is shut off from the bottom of the cylinder, and the "steam already there is permitted to pass from the bottom to "the top so as to impel the piston downwards. The upper part "opens into the cylinder at some distance from the top, so that "the piston in rising over it closes it, and cushions against the "steam retained above it. The lower end of the cylinder has two "ports, the one close to the bottom for admitting steam to raise "the piston fitted with a valve, which opens to let steam enter "the cylinder, but closes against its egress; and the other port "which communicates through the slide with the top of the "cylinder at some distance above the bottom, so that the piston "descending over it closes it, and cushions against the steam "retained below."

The hydraulic arrangement for raising the anvil block may be applied to other hammers.

[Printed, 6*d*. Drawing.]

A.D. 1860, March 21.—N° 738.

BLACKWOOD, JOHN.—The object of this invention is the so constructing furnace or fire-bars as to improve their lasting qualities, and facilitate the advantageous combustion of the fuel. According to one modification the bar is made or cast tubular and oviform in transverse section, the ends being suitably fashioned for resting on the cross bearers which support the grate surface. The atmosphere having a free passage through the bars, carries off a large portion of the heat communicated to them by the contact of the burning fuel, whereby the destructive effect of the heat upon the metal of the bars is counteracted. The upper part of the bars forming the grate surface may be flat, but the convexity of the oviformed bar is preferred.

The furnaces of locomotives, stationary and marine engines, when fitted with these bars, do not require any preparatory alteration.

[Printed, 7*d*. Drawing.]

A.D. 1860, April 17.—N° 959.

STEVENS, Charles. — (*A communication from Hypolitte Durand.*)—This is an invention of a novel arrangement for driving mill stones by steam power. The principle of action resembles the old pug mills, only instead of a horse being employed to drag round the radiating lever arm which gives motion to the main central vertical axis or shaft, a locomotive engine running upon a circular railway which circumvests the mill stones and gearing, is attached to the end of the lever and constitutes the moving power.

The axles of the wheels of the locomotive are placed at an angle corresponding to radial lines which intersect the central mill axis, and the wheels which run on the outside rails are made larger than those which run on the inner rails, in proportion to the circumferential measurement of each ring or rail, in order that all friction on the rails may be avoided. The framing of the locomotive conforms to the segmental curve of the rails, but its construction is not further described. Its rate of speed is 450 feet per minute, and the mill stones, of which there are two pairs actuated by suitable gearing on the main vertical axis, make 120 revolutions in the same time, the speed of each pair being increased by spur gearing on their respective axes.

An equable low temperature of the mill stones is maintained by means of internal radiating air passages, through which when the stones are revolving at the working speed currents of air are drawn in, whereby heating of the stones is prevented.

[Printed, 10*d*. Drawing.]

A.D. 1860, July 6.—N° 1634.

GRIMSHAW, Weston.—This invention relates to machinery combined with steam power for compressing brick earth, and other material. It consists :—

1st. In a " mode of stopping the pistons of those machines in " which the direct action of steam is employed for compressing " brick earth, and other materials, in order to produce bricks or " other articles of a uniform thickness; the piston rod is made " with a slot, through which passes a beam attached to the lid " or other convenient fixed part of the machine; this beam is " adjustable by screw nuts or otherwise, and when the piston " has performed its requisite traverse the beam arrests it; the " same object may be accomplished by making a shoulder on the " piston rod, which shoulder comes against an adjustable beam " or stop piece."

2nd. " Admitting steam to the top of the piston after the " stroke has been given, in order to bring the piston down so as " to be in its proper position for the succeeding stroke."

3rd. " When compressing articles that do not require to be of " a uniform thickness, such as artificial fuel, flour, or other material, but where the full force of the steam is required . . . . " providing a passage for the escape of the steam when the " mould fails to receive its proper supply; the passage may " merely allow the steam to blow off or convey it to the opposite " side of the piston."

4th. The application of a " false bottom to the mould boxes."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, August 8.—N° 1914.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Hippolyte Amédée Buquet and Raoul Jacques Marie Destrem.*)— This invention relates to an " excavating machine for boring " tunnels and performing other excavating operations."

The " machine consists of a strong under carriage or bed " mounted on wheels or rollers, upon which a frame carrying an " engine gear work and the excavating tools hereafter described " is free to be moved to and fro. The excavating tools consist " of a series of circular frames, wheels, or discs carrying on a " portion of their circumference movable teeth or chisels. These " tools act as circular saws; they are keyed on the same shaft, " say to the number of five, more or less, with a space between " every two. The engine" may be worked by steam, or by preference with compressed air, which " after performing its function in the " cylinder, escapes and aids in ventilating the tunnel or other

" confined work being excavated. As fast as the saws cut their
" way so is the frame advanced until they have penetrated to
" nearly one half of their diameter; the whole machine is then
" drawn back, and the portions of rock or earth between the saw
" cuts are readily knocked out by levers, wedges and other
" suitable tools, and removed; the excavator is again advanced,
" and operates as before."

"To open a tunnel with the excavating machine two similar
" machines on the same level are used, one somewhat in advance
" of the other, so that when the first machine has finished cutting
" its grooves it is drawn back and the second one advanced, while
" the workmen demolish the partitions left between the saw cuts
" of the first machine, and also between the courses of the two
" machines, and clear away the rubbish."

[Printed, 10*d.* Drawings.]

A.D. 1860, August 28.—N° 2071.

EFFERTZ, Peter.—This invention relates to machinery for making and transporting bricks and similar articles, and utilizing turf, peat, coal dust, and similar substances. It is supplementary to a prior invention, for which Letters Patent dated January 26, 1860, No. 201, were granted to this inventor.

The machinery combines the clay purifying apparatus, the moulding press, and the steam engine, the inverted cylinder of which, supported on or between two upright standard frames, gives motion to a horizontal crank shaft, which rests in bearings attached to the standards, and by means of toothed gearing imparts motion to the different functional parts of the apparatus, which purifies, mixes, and when prepared, raises the clay or material into appropriate moulds. Several modifications are illustrated and described. The first acts as follows:—The fresh clay is passed into a hopper, wherein, near an opening at the bottom, is a revolving shaft furnished with combs or beaters. The clay thus partly prepared is pressed through the opening into an elevator, wherein, fixed upon spindles, are spiral knives, and a grid for the detention of stones and other objectionable matter. The knives raise the clay and press it through the grid into a drawer, whence it is pushed forward over the moulds, and forced therein by pistons or pressers. The bricks are raised by an upward movement of the bottom of the moulds, and shifted on to adjustable endless webs or aprons contained in frames, and thereon carried to the drying ground by means of a system of wagons, running on tramways or otherwise, means being provided for facilitating the unloading without injury to the bricks.

[Printed, 8*s*. Drawings.]

A.D. 1860, October 10.—N° 2466.

SCOTT, John.—(*Provisional protection only.*)—This invention relates to the manufacture of anchors, and to the apparatus employed. Instead of, as in making the common admiralty anchor, first welding the two palms on the two arms, and then welding the two arms to the but end of the shank, the two arms with the palms and shank are, without welding in the anchor shop, forged in one piece. For this purpose, the bed plate on which the ordinary steam hammer works, instead of being flat is made in the form of a trough or open space, "so that the shaft " and arms not being hammered on under the hammer, but " going down below it in the open space, by turning and moving " the anchor every part can be brought under the hammer, " whereas if the bed was flat, as in the ordinary steam hammers, " this could not be done."

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 4.—N° 25.

FAIRBAIRN, Andrew.—(*A communication from John Haswell.*) —" This invention relates to a novel arrangement of press or " hammer for operating upon large masses of metal by the com- " bined agency of steam and hydraulic pressure, the object being " to obtain an economical and efficient substitute for heavy steam " hammers. To this end, the hydraulic press used to impart the " forging pressure to the metal to be operated upon is provided " with two cylinders, one being immediately above the other, and " their axes coinciding. The diameter of the upper cylinder is " small compared with that of the lower, the upper cylinder " being intended to receive a differential piston, while the lower " cylinder is fitted with the press piston that carries the hammer " of the compressing die. The rods of the two pistons are con- " nected together outside the press by coupling rods, so that " when water is admitted to the underside of the differential " piston, and the escape valve for the water that gives the pres-

" sure to the hammer is opened, the hammer will be quickly " raised from its work to the required elevation for repeating the " blow."

The hydraulic cylinders are supplied with water at any pressure by two force pumps, which have their action by turns direct from a large horizontal steam cylinder, lineally disposed between them, so that the rod which carries the steam piston, works to and forth through the ends of the steam cylinder, and at each end carries a crosshead, to which respectively the plungers of the two pumps are rectilineally attached; these by acting alternately, keep up and supply under great pressure, a constant stream of water, which is conveyed to the press hammer cylinders by suitable pipes. The valves of the hydraulic cylinders are operated respectively by a small pair of auxiliary engine cylinders. These are mounted upon the main steam cylinder, and have their slide valves, by means of separate handles, under the control of the workman. The steam slide valve of the main cylinder is operated direct by the piston rod of a small horizontal steam cylinder, the slide valve of which is actuated by a tappet on one of the crossheads of the main piston rod, and a cut-off valve is operated by a slotted lever moved by a stud fixed to the crosshead at the opposite end.

The power of the ,press hammer is equivalent to the steam power on the main piston, and articles of large or small dimensions can be treated with either heavy or light blows, without relation to the height whence the hammer falls. The velocity and number of blows given per minute, which in comparison approaches the steam hammer, is due to the efficient action of the two auxiliary steam cylinders.

This press hammer, it is stated, works without either noise or vibration.

[Printed, 2*s*. 9*d*. Drawings.]

A.D. 1861, April 2.—N° 809.

WINTON, John Grieve, and COWAN, Thomas William.—This invention relates to modifications of forge, machine, and other hammers combining mechanical and direct motive power action.

The first described consists of a single standard frame, suitably *formed and* having a strong base, which constitutes the anvil block. The upper end of the hammer block receives the lower end of the rod of a piston, which works upwards to and forth in an inverted steam cylinder, fixed to the overhanging face of the upper part of the frame. The hammer block is lifted mechanically by a cam tappet, which is fixed upon a shaft and has a coupled bearing at the back of the standard, and by means of a strap and pulley obtains motion from a steam engine or other motive power. The cam at each revolution of the shaft depresses the free end of a horizontal lever, which has its fulcrum on a bolt projecting from the frame; the other end of the lever is attached by a short link to the hammer block, and by these means, when the hammer block rises, the piston is forced up to the top of the cylinder, which has upon it a chamber, wherein the air contained in the cylinder is forced by the rising piston and compressed, unless a light blow be required, in which case the air is allowed to escape, and air is retained below the piston to moderate by cushioning the fall of the hammer; but when heavy blows are required, the reaction of the compressed air is employed to add energy to the blow when the hammer falls. The air is admitted both above and below the piston by valves that close against its emission, which is regulated by cocks under the control of the workmen.

Steam hammers have an air cylinder fixed upon their steam cylinder, so that one piston rod answers to both. The steam, which is admitted through an equilibrium valve and raises the hammer block, is exhausted through a passage into the upper part of the cylinder, where it acts expansively above the piston, and imparts its energy to the hammer's fall, assisted, as required more or less, by the compressed air in the cylinder above.

Hammers are also operated entirely by compressed air pumped into receivers by suitable pumps, the plungers of which act upon a medium of water, and the same principle is applied to pile driving machines.

[Printed, 2*s*. 5*d*. Drawings.]

A.D. 1861, April 3.—N° 821.

WRIGHT, THOMAS, and WRIGHT, HUGH.—The object of this invention, is the direct application of the elastic pressure of steam to brakes, for retarding or stopping colliery and other stationary engines and machinery. For this purpose, an open ended steam cylinder, and a piston and rod are employed, to which respectively the free ends of the brake straps, bands, or blocks are attached. Both the cylinder and the piston are movable, and so arranged that when steam is admitted between the closed end of the cylinder and the piston, they are caused to move in opposite directions, and by acting divergently and simultaneously pulling against each other, tighten the brake straps round the periphery of the brake wheel or pulley, or, according to one modification, causing by suitable contrivances, the brake blocks to converge, and press from opposite directions upon the periphery of the wheel. By means of a quadrant lever, the throttle valve which supplies steam to the engine, is closed at the same time that steam is admitted to the brake cylinder through a three-way cock, which also answers for the exhaust; when this takes place the brakes are relieved, one by a counterbalance weight, and the other by the weight of the cylinder. The constructional arrangements require modifying to suit various modes of application.

[Printed, 7*d*. Drawing.]

A.D. 1861, April 4.—N° 825.

ALLEYNE, John Gay Newton.—The object of this invention, which relates to the process of rolling iron, is to facilitate the manufacture of large masses, and also expedite the process of rolling thin plates or bars before the metal has time to cool. To this end:—

1st. Rolling iron. Two steam engines are employed to actuate the rolling mill by turns in opposite directions, in order that so soon as a mass of heated metal is passed between the rollers in one direction by one engine, the mill may be disconnected therewith and thrown into gear with the other engine, and the mass returned thereby through the same or other grooves in the rollers, whilst during the interval, the first engine employed has time to get up its speed and the momentum of its fly wheel. In this way the metal may be rapidly sent to and fro between the rollers, and the process be completed whilst the metal is hot. The engines being alternately relieved, have in the intervals time to recover speed, and accumulate the power necessary for the rapid performance of the process.

2nd. Relates to apparatus for readily and expeditiously moving the masses or the plates of heated metal in succession opposite *the several* grooves in the rollers, or from one rolling mill to another, before the metal has time to cool. For this purpose, travellers mounted on wheels which run on tramways are employed. The ways are laid on each side of the machines, which are lineally disposed, and the travellers or carriages are actuated by the motive power.

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1861, April 11.—N° 889.

SHAND, James, and MASON, Samuel. — This invention relates to the construction of steam fire engines and pumps. The steam boiler employed is of the vertical class, composed of two conical tubes; the inner tube forming the fire-box and chimney, is surrounded by water and steam space, inclosed by the outer tube, which constitutes the shell; by means of a horizontal tube fixed to the opposite sides of the shell, a transverse opening is made through the boiler; the axle of the hind wheels of the carriage passes through this tube, which is surrounded by water space inclosed by an outer tube attached to the opposite sides of the inner cone or furnace. Two or more single-acting steam cylinders are employed in conjunction with two or more single-acting pump cylinders, placed lineally to act in pairs, so that the steam piston and pump piston constituting a pair, are connected and fixed a certain distance apart by intervening rods. The crank shaft crosses the space between the steam and the pump cylinders, passing between the rods; the crank throws corresponding to the axial lines of the cylinders are set at suitable angles, and the connecting rods may be jointed to either the steam or the pump pistons as most convenient. The steam slide valves and steam chest are fitted on the covers of the cylinders. Metallic pistons and packings are used. The valves of the fire engine, made of metal, vulcanized india-rubber, or other material, are accessible without removing or deranging any part of the machinery.

[Printed, 10*d*. Drawing.]

A.D. 1861, April 13.—N° 905.

GWYNNE, James Eglinton Anderson.—(*Provisional protection only.*)—This invention relates to the construction of steam or other motive power machines, for breaking or crushing stone and other substances. The apparatus when required to be portable is mounted on wheels, and comprises two side frames whereon at one end is fixed the box containing cutters, breaking bars, and other contrivances, and at the other end the gearing for moving the hammers, which may be fixed in a horizontal row, turning round on one axis, and lifted by levers fixed on the moving shaft, to which the power is directly applied. Buffers are provided to receive the blows of the hammers when there is not sufficient material beneath, in order to prevent striking the cutter plates, the weight of the blows being regulated by springs. The stone or material when forced between the cutters falls upon a vibrating perforated platform or sieve, having holes of different dimensions for sorting the various sizes of broken stone into separate heaps. A feeding apparatus can be arranged to bring, and after the operation take away, the material. The cutters are arranged and shaped in various ways according to the nature of the work, and they may be placed on elastic cushions. A steam cylinder is sometimes applied to work the machines direct; they are also worked by other motive power. Other arrangements and details are proposed.

[Printed, 4*d*. No Drawings.]

A.D. 1861, May 2.—N° 1095.

WILSON, John Charles.—(*Provisional protection only.*)—This invention relating to machinery employed in the manufacture of sugar, consists—

1st. In conjoining, either direct or by means of intervening girders or base plates, the sugar cane mill with a steam engine and steam boiler suited to burn wood or "megass," so that the whole may form one combined arrangement, and the united weight of all the parts contribute to the steady working of the machinery when in operation.

2nd. Employing a boiler formed with a circular top, straight or curved sides, and a flat base, and having a large internal furnace placed in a flue of large capacity, for the purpose of burning wood fuel; when required to increase the evaporating power of a boiler, it is proposed to place water tubes in the flues.

3rd. Transmits the power of the engine to the sugar mill *by means of* bevel gearing, instead of the spur gear usually employed; and instead of cast iron, makes all the gearing employed either of steel or wrought iron.

4th. Constructs in one piece of steel or iron each of the sugar mill rollers, with its shaft and pinion either cast or forged solid therewith.

5th. Employs wrought iron or steel either separate or combined for the entire construction of the side standard frames, and instead of a screw employs a wedge operated by suitable mechanism for regulating the height of the rollers, and a spring that constantly presses against the bottom roller in combination with the trash turner, for the purpose, when the rollers are "opened," of preventing the crushed cane falling into the juice.

6th. In cases where sugar mills are driven by water power, dispenses with the ordinary brickwork breast and foundations, and places the wheels in an iron trough or "breast," to which the mill is conjoined.

7th. Relates to arrangements for the gearing and parts in connection with mills actuated by the power of animals.

8th. Vaporizes the aqueous portions of saccharine fluids by means of heated air instead of the ordinary boiling process; the air when heated to the necessary temperature is passed over the surface of the fluid.

[Printed, *4d.* No Drawings.]

A.D. 1861, May 6.—N° 1138.

JOHNSON, William.—The object of this invention, which relates to railway carriages and locomotive engines, is to facilitate their running round curves. To this end the body of the carriage, which may be of considerable length, is mounted on four-wheel trucks or under-carriage frames, one truck or frame being placed a suitable distance from each end, and each truck has liberty to move in conformity with the curve of the rails; they are held respectively by a vertical axis or pivot attached to the underside of the carriage body, and disposed over the outer end axle of each truck. Upon these outer axles the rims of the wheels are plain, and instead of a flange, small disc wheels mounted on a horizontal shaft, respectively beneath the end axle of each truck, are fitted to sustain the lateral pressure against the rails; the inner or contiguous wheels of the two trucks are flanged. Each under frame is provided with one set of central buffers rectilineally arranged, and the axle bearings may be of the ordinary description, or otherwise. When the carriage is running on a straight line of rails, all the axles of the several trucks or under frames are relatively parallel, but when running round curves, the axles of each truck point in radiating lines to the common centre of the curve.

Locomotive engines constructed upon this principle have long cylindrical boilers mounted on four-wheel under truck frames, one frame at each end with liberty to swivel on a vertical axis or pivot attached near the ends respectively to the under side of the boiler, and each truck frame is to be driven independently by a separate pair of engines.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1861, June 3.—N° 1386.

PENRICE, Herbert Newton. — This invention relates to " machinery for tunnelling and driving galleries through rocks " and other strata."

In the specification of a former patent, dated November 6, 1858, No. 2481, tunnelling machinery is described, worked by steam supplied from a boiler at a distance. According to the present invention, the steam required to actuate the machinery is supplied by a boiler of the locomotive class and connected therewith; the whole combination of boiler, engines, and machinery being mounted on wheels, is advanced as the work progresses by means of worms on shafts, respectively disposed on each side of the boiler. Arrangements are made for driving these shafts at a speed suited to the nature of the work, the worms engaging with worm wheels fixed upon the axles of the supporting wheels, which incline towards each other, and have their peripheries formed to suit the curvature of the tunnel. The valves of the steam cylinders which actuate the cutting implement, and the pump or pumps are by the aid of suitable gearing worked by the piston of a small additional steam cylinder, which also drives the screw shafts, and an endless chain of scrapers is arranged for removing from the face of the working, the debris which is brought down by the cutting tool. As described in the former specification, this tool consists of a large disc or head mounted on the end of a main horizontal shaft, which has rapid to and fro *longitudinal* movement, and as the work progresses is carried by the carriage up the centre line of the tunnel. The cutters are fixed on the face of the disc, which delivers blows in quick succession direct against the face of the working, revolving slowly at the same time.

The products of combustion and waste steam are carried off by a pipe supported near the roof of the tunnel, the draught therein, when necessary, being aided by a fan, which assists the ventilation.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1861, June 7.—N° 1442.

HARLOW, Robert.—This invention relates to the furnaces, bridges, and tubes of steam boilers.

In lieu of the ordinary brick bridge, a wrought-iron vessel with welded joints is employed, and conformed in shape to suit the transverse section of the flue. The ends of a number of steel tubes passing through this hollow bridge are set into the front and back plates respectively, and form passages from the furnace through the bridge for a portion of the fire draught, which also passes through a narrow opening over the top, where there is a communication between the hollow bridge and the interior of the boiler through the upper part of the flue, and there is another communication between the lower part of the boiler and the bottom of the bridge, which insures circulation of the water; this bridge is applied to boilers with either internal or external furnaces.

Steel water-tubes six inches in diameter, and diagonally disposed at close intervals in alternate position, form transverse water communications across the internal flues of steam boilers. The ends of these tubes are contracted hemispherically, and have a small opening at each end; when placed in position, one end rests in a cup-shaped washer, and the other is maintained by a ferrule whereon is formed at one end a left, and at the other a right-handed screw thread; one end of the ferrule fits into the end of the tube, and the other passes through the metal of the flue into the boiler, and by means of nuts and lock nuts the tubes are held by divergent pressure against the opposite sides of the flue, an annular cup being formed round the bottom of the ferrule and also round the top nut to receive a packing of cement, whereby to insure water-tight joints.

[Printed, 10*d*. Drawings.]

A.D. 1861, June 11.—N° 1488.

STEVENS, Charles.—(*A communication from Adolphe Joseph Canu.*)—This invention, relating to a crushing and pulverizing machine, is general in its application to most kind of hard and soft substances requiring to be pulverized, crushed, or ground, either in a moist or dry state. It consists of a round horizontal plate of ironstone or other hard substance, fixed on the top of a vertical spindle, which is caused to revolve by suitable gearing actuated by the motive power. Circumposed above the surface of the plate is a number of circular discs of iron, or other hard substance, each disc being fixed on a vertical spindle; these are capable, by means of screws, of being raised or lowered, so as to bring the grinding surfaces of the discs more or less in contact with the upper plane or surface of the revolving plate. The disc spindles carry strap pulleys, whereby each disc is caused to revolve on its own vertical axis, with its grinding surface in contact with, or a suitable distance from, the upper surface of the revolving plate. The contiguous surfaces of the plate and discs may be plain or suitably grooved or prepared, and the revolving speed of the grinding surfaces regulated to suit the nature of the material to be operated upon. The plate is mounted upon a suitable frame, and inclosed by a casing provided with a door for introducing the rough material, which, when pulverized or ground, falls into a receptacle beneath the machine, and thence is removed by an endless chain of buckets or otherwise.

[Printed, 10*d*. Drawing.]

A.D. 1861, June 21.—N° 1601.

HOBSON, William. — This invention, relating to steam hammers, "contemplates the substitution of a simple self-acting "motion and peculiar cylindrical valve for the complicated "gearing generally in use. To the guide handle is attached a "slotted or morticed tabbett, which moves upon an elbow "tabbett connected with a rod which actuates the steam valve; "the trip or hammer, in moving, strikes against the elbow "tabbett, and therefore influences the sliding tabbett, rendering "the combination self-acting. The valve is cylindrical, and acts "vertically; it is formed with flanges, so as to admit of a con"*centric* space for steam. When the valve is raised so that the

" top flange passes above the steam port or orifice in the top of
" the cylinder, this port becomes the inlet, and depresses the
" piston and hammer; the length of the valve is so regulated
" that the lower steam port is then below the lower flange, and
" becomes an exhaust port, the steam passing off through the
" centre of the valve to the exhaust pipe at the top. When on
" the contrary the valve is depressed, the lower flange passes
" below the port in the bottom of the cylinder, which then
" becomes the inlet, the exhaust steam passing off by the top
" port to the outlet."

The valve is a hollow cylinder open at the top and closed at the lower end, whereto the valve spindle is attached. Around each end of the valve cylinder there is a flange; these flanges fit respectively to slide in the cylindrical valve chamber, the steam having admittance therein to the concentric space formed between the flanges. The vertical motion is imparted to the valve spindle by a lever arm attached to a small rocking shaft, whereon is fixed an elbow tappet, which obtains motion from a stud roller carried by the hammer block. When the hammer is self-acting, this roller strikes the tappet, and, by moving the shaft, raises the valve, whereupon, the steam being exhausted below the piston and admitted above, the hammer falls; at the lower end of the stroke the stud roller comes against a sliding tappet, which moves the elbow tappet and reverses the valve. The sliding tappet is operated by a handle to start the machine, and to vary the length of stroke.

[Printed, 9*d.* Drawing.]

A.D. 1861, June 29.—N° 1665.

CLARK, WILLIAM.—(*A communication from Francis Burgess Scott, James Brayley, and John Beman Pitts.*)—This invention, relating to the construction of steam excavating machinery especially adapted to deep tile draining, consists in applying and operating, a "rotary spade wheel," which is capable of working with its axis below the surface of the ground while driven by machinery above, the object being to cut a deep trench with vertical sides. The apparatus comprises a strong rectangular frame, whereon is mounted a steam boiler and an engine, which gives motion to the excavating spade wheel and its appurtenances, and advances the machine at a speed corresponding with the progress of the work, along a line of movable rails. The periphery of the spade wheel is furnished with a series of curved projecting blades, fixed at regular intervals to its periphery, so as to cut and bring up the earth as the machine progresses over the line of the trench. The axis of the spade wheel is carried by side plates fixed to a frame, which is made to swing on a fixed centre for the purpose of lowering the wheel to the required depth, and raising it above the surface when not in operation; the sides of the wheel are inclosed by disc plates, in which respectively is regularly formed concentric with the axis, an annular series of radiating mortices, which answer as spur gearing to receive the teeth of two pinions fixed on vertical shafts, disposed, one on each side of the wheel. These shafts receive motion through bevel gearing from the engine crank shaft, and impart rotary motion to the spade wheel. The upper part of the wheel revolves between two guard plates, which, at the level of the top of the wheel, are respectively bent outwards to receive and deposit at the sides of the trench, the earth as it is brought up by the wheel and scraped off by an endless chain of scrapers contrived for the purpose. The engine and boiler are not particularly described.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1861, July 15.—N° 1780.

GÖSSELL, Otto John Theodore.—(*A communication from Heinrich Ehrhardt.*)—(*Provisional protection only.*)—This invention of a combined locomotive engine and carriage is described as follows:—" The express railway carriage (so called by the " inventor) differs from the ordinary railway train in so far that " it is a combination of the three principal parts of an ordinary " train, and includes in one body, and mounted upon the same " framing, 1, a locomotive engine; 2, a tender to carry water and " fuel; and 3, a carriage or compartments to receive a limited " number of passengers. The whole carriage will not exceed " twenty-five feet in length."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 19.—N° 1818.

SHAW, Philander.—This invention relates to the construction of hot air engines, and to generating steam by passing the exhaust heated air through a multitubular vertical boiler.

1st. The engine comprises two single acting cylinders with trunk pistons, which have their respective connecting rods coupled to crank arms fixed at right angles on the ends of a horizontal shaft, supported in standard bearings resting upon a foundation casing, which forms a reservoir for the heated air, and contains a furnace which receives the air in a compressed state, the products of combustion passing therewith through the cylinders.

2nd. Describes the construction of the piston and piston trunks, which are combined with pumping apparatus for compressing the air previous to its passage through the furnace, the action taking place alternately beneath each cylinder every successive return stroke of the pistons.

3rd. Forms a circular groove internally round the lower part of each cylinder to contain a lubricant, into which the lower edge of the piston may dip, and so lubricate the cylinders internally every successive stroke.

4th. Forms an internal projecting flange round the bottom of each cylinder to deflect the cinnerary particles which are carried forward with the heated products from the furnace; this flange may form part of the boundary of the circular groove.

5th. Relates to an auxiliar valve employed to admit comparatively cool compressed air into the clear spaces about the cylinder, for the double purpose of balancing the pressure on the inlet valve, and the keeping of the frictional surfaces cool enough fo lubrication.

6th. Regulating the flow of heated air to the pistons without permitting its escape and consequent loss.

7th. Describes an exhaust receiver, which is fitted within the air-tight reservoir to assist in heating by radiation the currents of air that supply the furnace.

8th. Describes a vertical tubular boiler wherein steam is generated by the heated currents of exhaust air, which steam may be employed to operate a piston and air pump, for compressing the air which supplies the caloric engine, or for other purposes. This boiler, which is provided with a furnace, may be made available for starting the caloric engine.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1861, July 19.—N° 1821.

SAVORY, William, and SAVORY, Paul Haines.—This invention *relates to* a steam winding apparatus, adapted for steam ploughing, winding at pits and quarries, and similar purposes. The winding drum consists of a cylindrical shell of wrought iron, which circumvests the horizontal body of a cylindrical stationary or portable boiler. Cast iron rings are fitted into and support the ends of the drum; one or both of these rings are furnished with toothed gearing, whereby, by means of pinions actuated by an engine mounted on the carriage framing, the drum is caused to revolve in either direction, being supported and kept in position by a series of rollers, arranged at intervals round the boiler and having their axes in bearing brackets affixed thereto. For guiding or laying the rope on the drum, " a pulley is fixed on a horizontal " spindle in a suitable frame, to receive or bear the rope from the " plough or other thing to be drawn; two other pulleys are fixed " on the same frame on vertical studs or spindles with grooves " turned in each to fit the rope, and placed one on each side of " the rope, so that the grooves of the guide wheel are opposite " the periphery of the drum where the rope runs, and connected " with suitable wheels to the internal gearing of the drum ring. " The pitch of the screw is proportioned so as to move the frame " during one revolution of the drum a distance corresponding " with a little more than the thickness of the rope."

[Printed, 10*d*. Drawing.]

A.D. 1861, August 20.—N° 2068.

BROOMAN, Richard Archibald.—(*A communication from Charles Halphen.*) — (*Provisional protection only.*) — " This invention of a " steam mill or apparatus for transmitting motive " power " consists in imparting rotary motion to a shaft (by preference in a vertical position) by means of a locomotive engine, which is " free to travel round a circular platform. The shaft " is connected to the locomotive by a lever, and carries a drum or " drums, pulley or pulleys, round which the driving straps pass. " In some cases gearing is used for transmitting the power. " The central shaft carrying the drums may be above or below " the level at which the locomotive travels.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 5.—N° 2215.

SCOTT, Thomas. — (*Provisional protection only.*) — This invention relates to " apparatus for utilizing the surplus momentum " of railway trains and other moving bodies, and the waste and

" surplus power of locomotive and other engines." The apparatus when applied to a locomotive is actuated by the axle or axles of the wheels, and is brought into action when the speed is excessive at the descent of inclines or when the train is being stopped, instead of then applying the ordinary brakes.

It consists of an air pump which forces air into a reservoir or vessel capable of bearing a considerable amount of internal pressure; when in operation, every successive stroke of the pump increases the density of the air in the vessel, thereby absorbing additional power and progressively increasing the retarding effect until the momentum of the train is sufficiently reduced, or the engine is brought to a stand. The effect of ordinary brakes is thus obtained, whilst the power of the momentum is subdued and concentrated, to be again brought into action as auxiliary power, and applied in conjunction with the steam when additional power is required. Instead of an air pump, the engine cylinders may be adapted to force the air when the steam is turned off. In the case of stationary or other engines where the resistance is not uniform, excess of power may be absorbed and utilized in the same manner.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 14.—N° 2296.

HAWKSLEY, GEORGE.—(*Provisional protection only.*) — The object of this invention, is to render traction and locomotive engines more capable of turning and passing round curves, to effect which, the two driving wheels " are fixed on separate axes, " and the ends of these axes are received into and freely turn " within the nave of a toothed wheel. On the axis of each " driving wheel is a bevilled toothed wheel; these bevilled wheels " gear into the opposite sides of one or more, and by preference, " more than one bevilled toothed wheel, the axes of which are " carried by the toothed wheel, into the nave of which the ends " of the two axes of the two driving wheels pass. Motion is " given to this toothed wheel by means of a cog wheel or pinion " on an axis driven by the engines. By these means so long as " it is desired that the traction or locomotive engine shall be " propelled in a straight line, the two driving wheels will be " actuated by the bevil wheels equally, but when it is desired " that the traction or locomotive engine should turn, then the

" driving wheel which for the time being will perform in the outer
" or larger curve, will be turned more quickly than the other
driving wheel which is to perform in the inner or smaller curve.
' It is not essential that the bevilled toothed wheels should
" be on the axes of the driving wheels, as the driving wheels may
" be driven by pinions acting in toothed wheels fixed to the
" driving wheels, and the axes of the pinions may then receive
" motion in a similar manner to that above described in respect
" to the axes of the driving wheels, in which case it will be
" desirable that the pinion axes should be hollow, and they, and
" the cog or toothed wheel which carries the bevilled toothed
" wheel or wheels, turn on a fixed shaft or axis."

[Printed, 4*d.* No Drawings.]

A.D. 1861, September 28.—N° 2422.

KNIGHT, John Adams.—(*A communication from Wellington Lee.*)—This invention relates to steam pumping engines. "Two
" or more steam cylinders are arranged side by side or in any
" other convenient position, and the valve gear for working the
" valve of one cylinder is actuated or opened and closed by the
" movement of the piston of the other or contiguous cylinder. It
" will be found convenient in practice to arrange the working of
" the pistons in such a manner that when one piston is at mid
" or half-stroke, the other piston shall be at the end of the stroke.
" The operation of the valves and the arrangement of the ports
" for the induction and eduction steam is also so contrived
" . . . . that the exhaust of the steam from the cylinder
" may be arrested at such a point of the stroke as will prevent
" the piston from overreaching or striking against the heads of
" of the cylinders. By this means the cranks, excentrics, and fly
" wheels usually employed in steam engines may be dispensed
" with; and when the invention is applied to pumping engines a
" more uniform and equal flow of water or other liquid at all
" points of the stroke is effected. The pistons will also be
" allowed to pause at the end of each stroke, thereby permitting
" the valves of the pumping cylinders to close more gently and
" with less shock than they otherwise would."

The invention is supplementary to a prior communication, for which Letters Patent bearing date January 28, 1862, No. 226, *were granted* to W. E. Newton.

[*Printed, 10d.* Drawing.]

A.D. 1861, October 2.—N° 2452.

RÉROLLE, Denis.—(*Provisional protection only.*)—This invention relates to a steam digging machine, combined with a steam engine mounted on a locomotive carriage; also to a contrivance for shifting the soil. The digging apparatus "consists of a wheel "with teeth, which turning from below upwards, raises the earth "& throws it off in such a way as to allow the passage of the "machine. This wheel is put in motion by another wheel with "rollers which catches directly with its teeth; it is usually "furnished with scrapers."

The soil is shifted upon an "endless cloth or band having two "motions, one in a direction perpendicular to the axis of the "digger for carrying the earth to a certain height, the other for "transporting it in a direction parallel to that of the digger, "which is always accompanied by the endless band. When the "distance is long this band is made to pass over a line of small "cars, each having a small endless cloth or band placed under-"neath the band with earth; these small cars, the axles of which "are connected together by joints parallel to the moving axle of "the digger, receive from the latter the carrying movement; the "endless bands of the small cars are moved by another line of "jointed axles, & take along in their movement the band which "carries the earth.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 7.—N° 2499.

CHAPLIN, Alexander.—This invention relates to a combined apparatus, specially designed for ships' use. The apparatus comprises a vertical or other steam boiler, whereto is affixed one or two inverted steam cylinders, which give motion to driving, winding, or hoisting gear combined therewith, and also work the ships' pumps and windlass. Immediately in connection with the boiler is a cooking apparatus, so contrived that cooking may be effected with the steam from the boiler. There is also an oven inclosed by a steam jacket for containing high pressure steam. Provision is made for introducing steam into boilers for heating water, and into apparatus for distilling fresh from salt water for ships' use. A portion of the heated products of combustion from the boiler furnace are conducted into the flues of the cooking apparatus. When the boiler is not in use, a separate fire grate attached to the cooking apparatus supplies the heat.

[Printed, 8*d*. Drawings.]

A.D. 1861, October 9.—N° 2519.

NORMAN, JOHN.—This invention relates to the construction of steam hammers, and anvils for the same, and consists, instead of a cylinder, of a piston chamber, which is made in two or more longitudinal parts, and square or of other convenient form in cross section, so as to prevent the turning while in operation of the piston or plunger, and thereby dispense with the side guides, the piston shaped to correspond, being accurately fitted to work therein steam-tight with or without packing. The piston is forged upon the rod. One part of the piston chamber may be cast to the standard frame, which in some cases may be arranged to support two or more sets of hammer fittings, placed at opposite sides or circomposed around it.

The anvils comprised in several modifications, are made adjustable to receive different sized cresses, which may be formed on the anvil, or the latter may have sockets to receive them. In some arrangements "the anvil block is made so that it can be " turned either about a vertical or a horizontal axis to bring a " different cress under the hammer, provision being made by " means of grooves and keys, or otherwise, for locking it firmly " in any of its positions, and for bedding it in a solid manner. " The same anvil block may further be contrived to serve for " different hammers, one cress being in use under one, and a " different" cress under another.

[Printed, 10*d*. Drawings.]

A.D. 1861, October 19.—N° 2611.

FEARNLEY, THOMAS.—This invention relates to the construction of steam hammers. The steam cylinder is concentrically fitted with an inner cylindrical tube, which forms around it an annular steam chamber, wherein an annular piston operates; there are two piston rods which work vertically to and forth through stuffing boxes respectively disposed at opposite sides on the annular cover, and which are fitted into a crosshead formed on the upper end of the hammer top, which is a long parallel bar, carrying at its lower end the hammer head. This bar works up and down through the inner cylinder, which constitutes its vertical guide, and the two piston rods prevent any tendency to turn. Outside the lower portion of the hammer bar there is formed a spiral groove, which receives a slide, whereby, through suitable rods and levers, the steam valve is self-actingly operated, the extent of its motion being regulated by the inclining surfaces of two discs, respectively by means of handles under the control of the workman. A portion of each side frame is cast to the opposite sides of the cylinder; the other portions are separately fitted and firmly held thereto by the shrinking on of accurately fitting bands or hoops of metal, placed in their places in a heated state.

According to a modification, the upper part of the hammer tup is in form, an open trunk, fitted to slide up and down outside the cylinder, and inclosing the bottom cover and stuffing box, and also the piston rod, which is fixed and cottered into the lower end. Another modification is also described and illustrated, as also the application of the valvular arrangements to ordinary steam hammers.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1861, November 2.—N° 2754.

WILSON, John Charles.—This invention, relating to sugar-cane mills, consists in combining in horizontal position the steam engine and boiler with the mill and gearing, all being conjoined and fixed on one foundation or metal bed plate, so as at any time to be capable of removal. The steam boiler is of the wagon shaped horizontal class with internal tubes; the bottom arching upwards, forms an internal furnace of large capacity open below the fire-bars, capable of burning ligneous fuel, and inclosed at each side with water space which extends to the back and forms the flue; thence the products of combustion rise into a combustion chamber and pass through the internal tubes to the front into the smoke box, which is fixed over the furnace door and supports the chimney funnel. The boiler and engine cylinder occupy about one half in length of the foundation plate, low down on which, at its midlength in transverse position, is the crank shaft, mounted on coupled bearings attached to the plate; one end of the shaft carries the crank arm, and the other the fly wheel, both working clear of the sides of the foundation plate. The sugar-cane mill occupies the other end of the foundation plate; the rollers being geared together are driven by a large spur wheel internally geared and actuated by a pinion on a counter-shaft, which obtains motion from the crank shaft by means of bevel gearing. The speed of the engine is regulated by a ball governor, and the boiler is furnished with the usual appliances. The side frames which support the rollers of the mill are constructed of wrought iron or steel, and the lower rollers are raised and lowered by a wedge or wedges, which operate beneath the bearing brasses. Each of the rollers with its axle and connecting wheel is cast or forged in one piece of steel or wrought iron.

It is proposed that the trash turner should be constructed with a spring, whereby it is kept constantly pressed against the lower roller, in order to prevent the passing of the crushed cane, which is apt to fall amongst the juice.

The latter parts of the invention relate to the gearing of such sugar-cane mills as are driven by the power of animals, and to vaporizing the aqueous portions of saccharine matter by the application of heated air, which is passed over the surface.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1861, November 9.—N° 2813.

SIMPSON, George.—The object of this invention which relates, 1st, to boring apparatus, is to facilitate and economise the mode of working. This is effected by a series of counterbalance weights attached to ropes, that run through sheaves or pulley blocks disposed on the top of an upright scaffold frame, which is erected over the bore. The boring rods are severally of equal length; each rod is screw-threaded at one end, and provided with a screwed socket at the other, so that as the rods are lowered into the bore, they are screwed together end to end and form one continuous length. The number of counter-balances employed is equal to the number of rods, when divided into lengths of three or four, the counterbalances severally increasing progressively in weight in proportion to the number of rods in the bore. When say ten rods are down the bore, and about to be lifted, all the weights are up at the top of the scaffold, and the weight selected is equal to the united weight of the rods. By a suitable clutch the lower end of the rope is made fast to the top end of the rods, and with slight assistance from the winch, a number of the rods, *according to* the height of the scaffold frame is raised above the surface; these are detached, and a weight selected for the next lift, equal to the united weight of the remainder of the rods. In this way the rods are brought up, and they are lowered by the same means without the amount of labor usually required.

2nd. Relates to steam apparatus for imparting the necessary reciprocating motion to the rods and boring instrument. It comprises a portable steam boiler mounted on a wheel carriage, and having, according to one modification, a steam cylinder attached to a bracket which overhangs the bore, Arrangements are contrived for coupling the end of the piston rod direct to the boring rods, without the intervention of gearing or other moving masses. The valvular mechanism is similar to that employed in steam hammers, thereby enabling the operation to be carried on with varying degrees of energy and weight of stroke. The same boiler by means of an additional cylinder or cylinders, works a winch or winding barrel for raising and lowering the rods.

3rd. Describes a sludge or boring pump.

[Printed, 10d. Drawing.]

A.D. 1861, November 19.—N° 2904.

LEE, Jesse.—(*Provisional protection only.*)—This invention relates, 1st, to the construction of the wheels of traction engines, by adapting transverse metal bars to their peripheries in order to prevent slipping on the ground and to insure a better hold.

2nd. " Connecting together at will two of such said wheels " placed at opposite sides of the engine, or only connecting one of " said wheels with the spur wheel of the engine so as to be driven " thereby; this may be effected by placing each wheel loosely " upon the axle on which the aforesaid spur wheel is fixed and " by means of a lever wheel and clutch box fixing one or both of " said wheels on the axle, or releasing therefrom as desired."

3rd. " Adapting a broad wheel to the fire-box end of the boiler " of a traction engine, said wheel being constructed of two narrow " felloes connected together by transverse bars or plates of metal; " this wheel is mounted loosely upon an axle on which is fixed a " spur wheel driven by the engine; a lever wheel and clutch is " also employed for fixing said wheel on the axle so as to be " moved thereby as desired, or instead of constructing the afore- " said broad wheel as lastly above described, it may be formed of " two hollow cylinders, around which are formed projections;

" these cylinders may either be coupled together or separately
" with the driving spur wheel before mentioned, or be entirely
" freed therefrom by means of a lever handle and clutch."

[Printed, 4*d*. No Drawings.]

A.D. 1861, November 25.—N° 2964.

COWAN, Phineas.—This is an invention for utilizing the heat which passes from furnaces employed for reburning animal charcoal, a large portion of such heat having heretofore been wasted. To this end, applied to or combined with the furnace wherein the retorts, vessels, or cylinders which contain the charcoal are heated, or with the furnace flues, is a boiler or generator disposed in such position as to be exposed to the waste heat. This boiler may be of any form applicable for the purpose. A cylindrical boiler is shown as set on the top of the furnace, a set of retorts being placed transversely beneath; it may, however, be placed in any contiguous position where its surface is exposed to the current of waste heat. The feed water is heated by passing the feed pipe through the heated brickwork, and the steam generated in the boiler may before use be superheated, by causing it to pass through a coil of pipe or other superheating apparatus arranged in a flue or flues.

[Printed, 6*d*. Drawing.]

A.D. 1862, January 17.—N° 125.

ROWAN, John Martin.—This invention relates to the constructional arrangements and parts of that class of steam hammers which have fixed pistons and moving cylinders, the latter being cast with and partly constituting the hammer block, having side slides which work in vertical guides formed on the contiguous faces of the frame standards, the end of the piston rod being fixed in the top cross frame.

" The piston rod is made solid instead of being hollow, as here-
" tofore; and in one modification two separate pipes are provided
" for communicating with the interior of the moving cylinder.
" These pipes are attached to the upper part of the framing and
" communicate with the valve box or boxes, whilst their lower
" ends are entered through stuffing boxes into recesses or passages
" formed in the sides of the cylinder in the projecting flanges or
" slides, by means of which the cylinder is guided in the framing.

" These side passages communicate in this modification one with " the top and the other with the bottom of the cylinder. The " valvular details may be constructed according to any convenient " known plan, and may be arranged to permit of working the " hammer either with single . . . or with double action, for which " latter purpose both pipes or passages may be fitted with valves. " In another modification both passages are made to communicate " with the top of the cylinder, which will render the hammer " single acting only, and the same end may be obtained by means " of only one side pipe. In a third modification one side passage " with its pipe is used for the exhaust only, the other being used " for the induction. In all the modifications the employment of " the separate pipes permits of freer passages being formed for " the steam, and particularly for the exhaust steam, in connection " with cylinders of a limited size. The pipes may be fixed to the " cylinder, and work in boxes on the framing, but the arrange- " ment described is the more convenient."

[Printed, 10*d*. Drawing.]

A.D. 1862, January 20.—N° 146.

BIRD, Joseph.—This invention relates to the bearing parts of crank axles, which parts are fitted between the collars or shoulders with a crescent formed piece of cast metal fixed at that side of the crank bearing which is subject to the greatest amount of wear; a portion of the crank bearing is removed equal to the size of the cast metal piece, which when fixed on restores the circular form of the bearing. The cast metal piece is fixed by a screw, and when worn can be removed and replaced by a fresh piece perfect in form. Fixed axles with parts revolving upon them may, on the side most liable to wear, be furnished in the same manner.

[Printed, 8*d*. Drawing.]

A.D. 1862, February 3.—N° 283.

JOY, David.—This invention relates to power and steam hammers, and consists :—

1st. " In actuating hammers (hitherto driven directly by " tappets, cranks, cams, or eccentrics), by the intervention of a " spring or elastic medium between such tappet, crank, cam, or " eccentric, thus giving to the blow the character of elasticity;

" and to moderate the force of the blow, I take up such elasticity
" by allowing the hammer bar or block to work in a cylinder, or
" itself to be a cylinder, in which a piston is suspended, and I
" admit air freely to such cylinder, or check it therein, thereby
" checking the blow due to the momentum of the hammer bar or
" block driven as above described."

2nd. This part has reference to steam hammers, and is supplemental to a prior patent granted to this inventor, and dated November 1st, 1860, No. 2668. It "consists in leaving out the
" valve for the admission and exhaustion of steam, and in making
" the piston itself serve as a valve by allowing it to pass over and
" uncover a port or ports in the cylinder at proper intervals for
" the admission and exhaustion of steam; or I reverse the action,
" and make the piston stationary and allow the cylinder to move
" over it."

Claims the application and combination of any of the above arrangements, to steam and other engines.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1862, February 12.—Nº 371.

JOSEPH, John Stephen.—This invention, relating to coke ovens, is supplementary to prior letters patent granted to this inventor, and bearing date February 9, 1859, No. 362.

One of the objects now sought is the more perfect inflammation of the combustible gases; this is effected by introducing through orifices in the brickwork of the chambers and flues of the oven, regulated quantities of atmospheric air. By this means the greatest possible degree of heat is produced from a given quantity of coal.

Another part of the invention consists in utilizing the extreme heat, by employing it to generate steam in steam boilers, heating gas retorts, firing pottery, heating drying stoves, calcining ores, and burning lime. To accomplish either of the above processes, the hot gaseous current from the oven is conducted thence through suitable passages or flues, and caused to flow through the flues of a steam boiler, or is applied in the most suitable manner to effect others of the above-named processes, dampers being employed to regulate the quantity of heat required.

[Printed, 8*d*. Drawing.]

A.D. 1862, February 13.—N° 376.

JOSEPH, John Stephen.—This "invention consists in constructing a large retort, built up of fire-brick or other suitable refractory material, and surrounded by an outer structure of fire-brick or other suitable refractory material, in such a manner that a space is left all round the retort, the ends of the same passing through the ends of the enclosing structure, and being provided with suitable doors. In order to support the retort, I form piers of fire-brick or other suitable refractory material underneath the same. I prefer to construct the retort of a catenary, parabolic, or elliptic transverse sectional form, but I also construct it of any other other such transverse sectional form, that will stand firmly by itself, without requiring any material support for the sides. This retort oven I employ for either making coke, charcoal, or for any other similar processes, wherein combustible gases are disengaged. At or near the top of the retort, I form suitable openings, through which the combustible gases formed inside the same by any of the above-mentioned processes pass into the surrounding space. I introduce small jets of atmospheric air, both into the space between the top of the retort, and the surface of the materials inside the same, as also into the space surrounding the retort, and thus cause the more or less complete combustion of the . . . . . gases, thereby creating an intense heat, which having access to nearly the whole outer surface of the retort, causes the process which is taking place inside the same, to be effected in the most rapid and perfect manner. The hot products of this combustion, are either allowed to pass away to a chimney, or by preference, I employ the same for generating steam in a boiler or boilers, for making illuminating gas in retorts fixed either in the before-mentioncd space in the oven, or enclosed in separate chambers, for firing pottery in separate ovens, for heating drying stoves for general purposes, for calcining ores, for burning bricks, or for burning lime in kilns."

[Printed, 8*d*. Drawing.]

A.D. 1862, February 13.—N° 393.

McCONNELL, James Edward.—This invention relates to that system of railway brakes wherein the brakes are applied simultaneously to any or all the carriages in the train, and consists in the use of a force pump situate in the guards' van or other vehicle forming part of the train, or on the engine or tender, or both on the van and on the engine or tender, and worked either by the guard, or by the engine, or by eccentrics on the axles of the tender or van, for the purpose of forcing air or water into a pipe or pipes extending along the entire train and connected at suitable intervals with horizontal cylinders placed between the pairs of wheels in each carriage, such cylinders being provided with pistons or plungers, which on being forced outward by the action of the force pump, will apply the brake blocks directly to the wheels or axles simultaneously throughout the whole train. A safety pipe is applied to the main pipe for the purpose of allowing of an escape of the air or water when the brakes are applied, and means are employed for causing such escape to work a signal, whereby the guard or driver, as the case may be, will be warned that the brakes are full on, whilst at the same time the bursting of the pipes will be prevented by such escape. These brakes may also be worked by steam pressure from the boiler, if desired. The pipes may serve to warm the carriages by passing steam or hot water through them from the boiler.

[Printed, 8*d*. Drawing.]

A.D. 1862, February 28.—N° 552.

PARKER, JAMES.—The first part of this invention is supplementary to a prior patented invention dated October 2, 1860, No. 2374, which consists in effecting the propulsion of vessels, by discharging high pressure steam combined with air through a pipe of uniform diameter, which pipe opens through the bottom of the vessel into the water at or near the stern. The steam issues from a nozzle into the pipe, and whilst passing from one to the other a current of air is drawn in and mingled therewith. The steam employed is according to the present invention used in a superheated state, and in order that a larger quantity of air may be carried in by a given quantity of steam, instead of a single steam jet, two or several are used collectively equal to the area of a single large jet, and corresponding with the mouths of a like number of branch openings leading to the main air pipe. The annular air space between the jet nozzles and pipe mouths, may be made adjustable as to size like "Bunsen's" gas burners, or the "Giffard" injector, with concentric openings for the passage of annular streams of steam and air. Flat jets are by preference employed, also a number of small jets issuing into one common mouth of the air pipe. These arrangements may be so made in connection with the boiler flue, that the products of combustion from the fire are drawn by the impulsive force of the steam jets into the air pipe, and carried into the water at the stern. Vessels built for this mode of propulsion are to be fitted with a number of air troughs or channels, placed at an angle of 30 to 50 degrees with the water line. " The propulsive force of the air, and the " force of the air rising by its buoyancy may be used together for " propelling " in any direction, " and for steering vessels."

The invention also relates to the use of motive power, so obtained for imparting motion to machinery, " by causing the air " to act upon helices and horizontal and vertical turbines and " wheels immersed in water or other fluid to a greater or lesser " depth."

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 7.—N° 612.

FOWLER, JOHN, junior, GREIG, DAVID, and NODDINGS, RICHARD.—This invention partly relates to that class of steam cultivating machiney in which a balance frame is employed, such frame having a set of tilling tools or implements at each end. Instead of the frame as heretofore having its fulcrum on the axle of the carrying wheels, it is arranged to swing below it, depending by yokes from an axis supported on brackets which rest on the wheel axle.

So arranging the guiding or winding apparatus to a hauling-drum which turns on a vertical axis, that it can take any position round the drum which the angle of the rope at the time may require.

Employs a number of rotating steam cultivators, consisting of cylinders or axes armed with prongs, the main cylinder or axis by means of an endless chain imparting accelerated motion to the other or others, so that the main cylinder roughly breaks up the land, and the others revolving at a higher speed, reduce it to a fine condition.

So arranging the winding drums of steam cultivators, that they are capable of swinging partially round at an angle to each other, or to the carriage or engine to which they are attached, and thus adjust themselves to the line of the hauling rope.

When winding drums are mounted on vertical axes, arranges the boiler, engines, and windlasses, on a foundation capable of partially turning on the carriage frame, whereby to adjust the plane of the drum to the line of draught.

[Printed, 2s. Drawings.]

A.D. 1862, April 8.—N° 992. (* *)

BEARDMORE, William.—(*Provisional protection only.*)—"Improvements in steam rams for naval purposes." "The steam " ram consists of an iron-plated vessel, which is actuated by " steam power in the ordinary way. This vessel has fitted in it " one or more steam rams, which may be arranged at the bow or " stern or along the sides." Each of these rams consists of "a " powerful horizontal rod which forms a long sharp-pointed ram " for perforating the sides of any enemy's ship or floating " battery. These rods are intended to be made very heavy, and " to be driven outwards by one or more engines, a sufficient " amount of velocity or impetus being given to them either by " means of large fly wheels, by gearing, or" in "any other con" venient manner. With these rams, vessels constructed with " shot-proof sides may run close alongside an enemy's ship or " floating battery, and by means of the powerful horizontal rods " forced against the sides, quickly shatter the armour plates or " sides of the opposing vessel to pieces and sink her."

[Printed, 4*d.* No Drawings.]

A.D. 1862, April 9.—N° 1017.

NEWTON, William Edward.—(*A communication from Abel Brear.*)—This invention relates to "apparatus for raising and " forcing water and other liquids" by means of the impulsive force of a jet of steam or compressed air. Fitted on the top of the suction or supply pipe is a short socket pipe which branches laterally in opposite directions; to one branch is connected the delivery pipe, wherein there is a check valve, and entering through the opposite branch is a steam pipe, the end of which passes a short distance into the delivery branch, leaving an annular space round the end of the steam pipe or nozzle. "The issuing steam " or compressed air expels the water from the delivery pipe, and " *creates* a vacuum behind it. The place of the water so expelled " *is supplied by* water drawn up to fill the vacuum, or forced up

" into the socket from the well, reservoir, or other source by the " pressure of the atmosphere," and is driven forward by the steam through the delivery pipe in a continuous stream.

[Printed, 8d. Drawing.]

A.D. 1862, April 15.—N° 1091.

PHILIPPSON, Ferdinand Carl.—(*A communication from Louis Schwartzkopff.*)—This invention relates to steam hammers.

" The anvil is made moveable, so that it may be raised or " lowered . . . . in order to bring the material operated upon " to any desired distance from the hammer. The bottom of " the framing of the machine forms the anvil bed, in which are " formed two vertical hydraulic cylinders, containing water, oil, " or other suitable fluid, and a passage is formed in the anvil bed " by which the two cylinders communicate with each other, so " that when the ram of one cylinder is raised, the other will be " lowered, and vice versâ. The anvil block is carried on the top " of the ram of one of these cylinders; the ram of the other " cylinder is made of sufficient weight to counterbalance the " weight of the ram of the first cylinder, and of the anvil block " carried by it. The top of this ram is connected to a lever, by " which the ram can readily, as the two rams balance each other, " be raised or lowered, thus raising or lowering the ram carrying " the anvil block, and the lever can be retained in any position " by a screw bolt passing through the lever and through a slot " in an arc or quadrant fixed to the framing, and the lever can " by a lock nut on the bolt, be clamped in any position to the " arc or quadrant, or the lever may be otherwise held in any " desired position. The steam cylinder is carried by a block " bolted to the main frame; the piston is furnished with a heavy " rod, which passes through a stuffing box in the bottom of the " cylinder, and also through a guide at the lower end of the " block. . . . . The hammer is made double-acting, that is to " say, the steam is caused both to raise the hammer and also to " act on the top of the piston to force the hammer down." An equilibrium slide valve working between the cylinder valve face and a back plate admits the steam; the valve rod is " connected to " a lever, on which are two inclined arms, against which a roller, " carried by a pin projecting from the piston rod, comes alter- " nately as the piston rod moves to and fro, and thus turns the " lever on its centre and gives the requisite motion to the valve."

The force of the successive blows is regulated by the height to which the anvil is raised. A blow delivered at the end of the down stroke will be very light, but if given when the piston is a little below mid-stroke, the blow will be as heavy as the hammer is capable of giving, and between these two extremes, the energy of the blow can, by adjusting the height of the anvil, be regulated. A modification is described.

[Printed, 1s. Drawing.]

A.D. 1862, April 26.—N° 1228.

ALLEYNE, John Gay Newton.—This invention consists of apparatus which in combination with steam power is to be used in the preparation and manufacture of iron and steel.

The first part described relates to a preliminary mode of hammering masses of iron or steel preparatory to the rolling process; for this purpose two or more steel hammers are simultaneously employed upon the same mass, one hammer acting vertically thereon, and one or two disposed and operating in horizontal position, so as at the same time to act laterally upon the mass. The precise arrangement of these hammers depends uoon the form desired, and the nature of the work required to be performed. In some cases effect is given to the blows of those hammers which act laterally, by powerful compressed springs, and at other times the hammer is forced forward by the steam pressure alone, or in combination with the springs. Various plans are devised for imparting the necessary rectilinear movement to the horizontal hammer block or blocks, or in lieu thereof a swinging motion is imparted to the hammer or hammers, and the necessary provision made to the piston rods.

Another part of the invention relates to rolling the metal after the hammering process, and is supplemental to letters patent which were granted to this inventor and bear date April 4, 1861, No. 825. The object therein being to expedite the rolling process by combining the rolling mill, by means of clutches or otherwise, with two or more steam engines running in opposite directions. The present improvement consists in employing sets of engines which run separately, at different speeds in contrary directions.

The invention also consists in the use of circular saws combined with steam power for trimming or gauging the manufactured metal after the rolling process, for which purpose a small steam engine is combined with a circular saw frame and saws, and mounted therewith upon a carriage with wheels. The steam connections and pipes are arranged to permit the facile movements of the carriage within a limited range.

[Printed, 3*s.* 4*d.* Drawings.]

A.D. 1862, April 30.—N° 1272.

LEIGH, EVAN.—(*Provisional protection only.*)—This invention relates to the construction of ships' propellers, floating batteries, and mounting the guns.

Paddle wheel propellers, constructed after the manner of a water wheel with shrouds and air-tight buckets, are placed astern to work between pontoons, "the edge of each float being set a " little zig-zag." The air is compressed in the buckets as the floats enter the water, and rushing out as they leave, "pushes " the water away from them, the recoil acting in the direction of " propulsion."

Floating batteries.—Employs a steam cylinder about 60 inches diameter with ten foot stroke, and piston rod 20 inches diameter, working to and forth through a stuffing box placed in the hull of the vessel below the water line. The piston rod works through both ends of the cylinder; it is pointed and shod at the end with hardened steel, and with the piston weighs about 20 tons. The steam is admitted by turns to each side of the piston; the piston rod or ram, after the manner of the steam hammer, may, on an enemy's ship coming alongside, be made to strike prodigious blows in rapid succession.

Two guns, one counterbalancing the other, are mounted on the ends of a lever, which oscillates on a central pivot. By tilting the lever the guns are respectively raised to the level of the port hole, and adjusted by a screw when about to be discharged, the loading being performed when the lever is brought to a horizontal position, out of reach of the enemy's fire. "By these means the " heaviest guns can be easily moved about in any direction and " shotted with safety and rapidity, the recoil being taken up by " india-rubber or other elastic springs placed behind the steps of " the trunnions."

[Printed, 4*d.* No Drawings.]

A.D. 1862, May 3.—N° 1318.

FOWLER, John.—This invention has for its object the so constructing a portable steam engine with compound winding apparatus, that it may be used for hauling ploughs and implements requiring ordinary draught, or drain ploughs and such other implements as require a very heavy draught. The engine is of the ordinary construction, consisting of two horizontal cylinders superposed on the fire-box of a horizontal boiler, which is mounted upon a carriage on four wheels, the two main wheels being loose upon the main axle, and the fore wheels on an axle attached to a fore carriage. Underneath the boiler between the fore and hind wheels, two drums are mounted on vertical axes, and so driven by gearing properly proportioned and connected with the engine, that one drum will only revolve once whilst the other revolves several times. It is preferred upon the fast running drum to have nipping instruments, whereby to hold a rope passing partly round it. The slow running drum is preferred to wind on or coil up the rope, but it may also be made a strong nipping drum. In place of mounting both drums permanently, arrangements are made for the removal of the fastest drum, and a second slow drum is to be substituted and connected by suitably proportional gear, the engine framing to be prepared accordingly.

[Printed, 10d. Drawing.]

A.D. 1862, May 15.—N° 1468.

SISSONS, William. — This invention relates to combining steam power with pile driving apparatus, and to the catch employed for lifting and releasing the hammer.

It comprises an ordinary upright frame composed of "wood "guide pieces, side stays, and back ladders, all these points rest-"ing on a platform. This platform consists of two heights, an "upper and an under one; the upper part revolves on the lower "part in a similar manner to a turn-table, so as to enable the "machine to face any angle. On the upper part of this platform "is fixed a steam winch, which is provided with one or two "cylinders and valves, which have slides and eccentrics attached "to them. The connecting rod of this cylinder causes a shaft to "revolve by means of a crank; on this shaft is fixed a pinion,

" which gears into a cog wheel fixed on a shaft, which has a
" spiked barrel or drum on it; round this drum an endless chain
" revolves. This endless chain is of the pitched flat link kind,
" and revolves round the drum at the bottom, passes up the
" machine, and is carried over a wheel at the top of the machine,
" and in this manner revolves round a spiked drum at the bottom
" and a wheel at the top. The hammer moves on the face or
" outside of the guide pieces; an opening is made in the hammer
" from front to back to receive an eccentric or crank and catch,
" which are fixed on an axle passing through the sides of the
" hammer and the eccentric or crank. This eccentric or crank
" is worked by a lever, and pushes out a bolt or catch into an
" open link of the pitch chain as it ascends, and thus the hammer
" is lifted. The catch is released from the chain by reversing the
" eccentric or crank, which is done by an opposite lever striking
" against pins fixed in the guide pieces, and the hammer then
" falls on the pile."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1862, May 15.—N° 1471.

WRIGHT, JAMES.—(*A communication from Messrs. Couvreux and and Combe.*)—(*Provisional protection not allowed.*)—This invention relating to a steam rotative travelling crane, is described as follows :—" On a stand or framing of suitable weight and strength
" I place an engine and boiler, which through a pinion on the
" main shaft gives motion to a large cog wheel fastened on the
" spindle of the drum, on which is coiled the chain passing from
" it to the extremity of the jib, and terminating in a hook or its
" equivalent in the usual manner. A tie rod passes from the
" extremity of the jib to the extreme rear of the machine, by
" which means the weight of the boiler, engine, and the machinery
" counterbalances the weight of the substances or materials to be
" lifted. The whole apparatus turns on a circular rail round a
" pivot supported on a frame." "The crane can be transported
" from place to place by means of wheels, which can be raised
" or lowered by the action of a screw, and when not in use they
" may be drawn up out of the way of the circular rail."

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 19.—Nº 1516.

MORRIS, Timothy, **WEARE**, Robert, and **MONCKTON**, Edward Henry Cradock.—This invention relates to obtaining light and heat from electricity, which in order to obtain light, is passed through hermetically sealed vacuum tubes or vessels of glass whence the air has previously been exhausted, and carbonic acid gas, hydrogen, or other similar gases injected; or the vapour of sulphuric, nitric, or other similar ethers which yield different colors may be used according to the nature and colour of the light sought to be produced, such gases or vapour of ether to be so far exhausted until a sufficient vacuum is obtained to permit the electricity to flow freely from the points of platinum or other wire in connection with the induction coil, or the means employed for obtaining an electric current. Amongst the various uses of the light thus produced, it is applicable for lighting mines, as it is not capable of causing explosion from fire damp.

To obtain heat, electricity evolved from powerful batteries is used, by introducing into the liquor or substances to be heated spirals of flattened platinum or other metal wire, or metal sheets rolled in volute spirals, or disposed in such manner as to afford the greatest possible amount of heating surface, the ends of the coils or sheets or spirals being joined respectively to the poles of the battery. The heat thus produced may be applied to generate steam for steam engines, and for drying, warming, and such-like useful purposes.

[Printed, *4d.* No Drawings.]

A.D. 1862, June 4.—Nº 1678.

PEEL, George, junior, and **SIMPSON**, Joseph.—This invention relates to the construction, arrangement, and mode of working hydraulic presses, and to the force pumps employed.

Making the cylinders and rams of hydraulic presses "of steel
" instead of cast iron as heretofore; . . . . . making the columns
" of steel instead of wrought iron; and in making the framing
" for the top and bottom of the press of wrought iron or steel,
" either alone or combined with cast iron or other materials,
" instead of entirely of cast iron, the object being to unite great
" strength with comparative lightness."

"Making the rams and cylinders to work within each other in "the same manner as the slides of a telescope; the largest ram "works within a stationary cylinder, and the smaller ram works "within the larger ram, which acts as a cylinder; in this way "two or more rams of different diameters may be acted upon "successively to increase the power of the press as the speed "diminishes. When the smaller or smallest ram has been raised, "self-acting blocks come into action to support the follower, "which is then carried forward by the action of the succeeding "ram."

"The mode of working hydraulic presses consists in forcing "the water that has been used to raise the ram or rams into an "air vessel, in which it accumulates under pressure, and in conveying this water again into the cylinder or cylinders of the "press for the purpose of partially raising the ram or rams during "the next operation, by this means the rams are rapidly raised "while the pressure to be overcome is small, thus economising "power and time in working the hydraulic press. The air vessel "may be charged direct by the pumps when the pumps are not "required for working the press."

"The arrangement of force pumps for hydraulic presses consists "in connecting the plungers of two or more pumps to a beam "working on a fulcrum; the piston rod of a steam cylinder is connected direct to one or both ends of the beam, thereby applying "the power in the most convenient manner for working any "convenient number of force pumps; the pumps are or may be "of different diameters, and they are provided with self-acting "valves, so that as the resistance increases, the larger pumps are "successively thrown out of action."

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1862, July 9.—N° 1982.

BUTLER, John Octavius. — (*Provisional protection only*).— "This invention relates to the framing or supporting standards "of steam hammers, and consists in making such framing or "standards of wrought iron in lieu of cast iron as heretofore. In "some cases the standards may be constructed in one piece of "wrought iron, and shaped either by forging under the hammer, "or by suitable dies and pressure. For large hammers the "supporting standards would be composed of several wrought-

“ iron plates rivetted together, and strengthened by angle, T, or
“ other suitably shaped bars, as is well known in the making of
“ wrought iron structures.”

“ According to one form of framing for heavy hammers it is pro-
“ posed to support the cylinder upon a wrought-iron entablature
“ formed either of wrought-iron hollow beams or of plate girders.
“ This entablature or platform is supported at the four corners by
“ wrought-iron hollow columns of a round, square, or other
“ section, and composed of plates rivetted together, and strength-
“ ened by angle irons inside, and by ribs or feathers on the out-
“ side thereof, also rivetted thereto; or in the place of having the
“ columns hollow, they may be forged in one solid piece, or they
“ may be made hollow, and the several plates therein united
“ together by welding, the same mode of uniting being applicable
“ to the other portions of the framing. The guides for the
“ hammer block and piston rod are also formed of wrought iron,
“ and are secured to the framing by rivets or otherwise, or forged
“ in one piece therewith.”

[Printed, 4d. No Drawings.]

A.D. 1862, July 14.—N° 2017.

GEDGE, William Edward.—(*A communication from François Escapat.*)—(*Provisional protection only.*)—This invention relates to a “portable or stationary steam lift and force pump.” Two closed cylindrical vessels are placed upon supporting columns above the reservoir or water supply, which is reached by a suction pipe surmounted by a valve box, wherein are two valves which govern the passages into two junction bends, forming communications respectively between the suction pipe and the upper part of each cylinder. Within the suction pipe there is fitted a spiral vane, which by means of the upward flow of water is caused to revolve and operate a small pump; this pump forces water received from the suction pipe into a small open cistern placed above the top level of the two cylinders, each of which is provided at bottom with an outflow pipe, having a valve to close against the atmosphere. The two cylinders receive steam alternately from a contiguous steam boiler, which steam is condensed by injection water from the cistern. In this way a vacuum is formed in the cylinders, and by turns the water is forced up the suction pipe and into the cylinders by the pressure of the external atmosphere.

In each cylinder there is a float which rises when the water flows in, but which at the end of the outflow settles upon a small ball float, which acts as a lever, and communicates externally with the taps and valves employed to regulate the admission and emission of the steam and of the injection water.

[Printed, 6d. Drawing.]

A.D. 1862, July 29.—N° 2145.

COLBURN, Zerah.—The object of this invention, which relates to steam pumping engines, is to simplify their construction by dispensing with those parts which require rotary motion, also counter-weights, stuffing boxes, and complicated valve gear. The steam cylinder, pump cylinder, and the pump valve chamber are lineally disposed and cast together in one piece, and the steam and pump pistons are either cast in one piece upon an intermediate stem, or fixed thereon sufficiently far apart to prevent the exposure of any part of the cylinder casting to the alternate action or temperature of the steam and water; no piston rod is required. When the steam is admitted to the outer end of the steam cylinder, the two pistons move together, and the water is driven out of the pump cylinder through the outflow valve; the steam cylinder is then put into communication with a condenser, and upon the formation of a vacuum in the steam cylinder the piston returns, and the atmospheric pressure on the water externally forces it up the suction or supply pipe through the inlet valve and again fills the cylinder of the pump, the successive strokes of the steam piston forcing out the water by the pressure of the steam. Piston valves are employed to admit the steam to the steam cylinder and regulate the exhaust. By combining two of these pumping engines a constant stream of water may be raised. Several modifications are fully described and illustrated.

[Printed, 2s. 6d. Drawings.]

A.D. 1862, August 9.—N° 2228.

MACINTOSH, John. — (*Provisional protection only.*) — This invention relates to obtaining and applying motive power. It
“ is intended when required to dispense with the time occupied
“ in first generating steam of sufficient pressure to put machinery
“ in motion, and to give increased power and velocity to steam
“ vessels; also instantly to obtain power to work fire-engines,

" and consists in the rapid generation of power by the aid of
" oxygenous fuel, composed either of coke, coal, and nitrate of
" soda, or coke and nitrate of potash. In some cases sulphur
" may be used, or the chloride of potash; and, if desired, put
" into form with adhesive substances, such as mineral or vege-
" table pitch, resins, paraffine, gutta percha, caoutchouc, or
" glue."

"The prepared fuel is put into closed tubes or furnaces, with
" valves for the escape of the gaseous products of the combus-
" tion, which may be used alone or in combination with steam,
" air, or other fluids in giving motion to machinery. This
" oxygenous fuel may be put into ordinary steam boilers, which
" fuel when ignited instantly produces power to give motion to
" engines, or it may be used for other purposes where power is
" required as an auxiliary."

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 10.—N° 2493.

RIGG, Arthur, junior.—This is an invention of apparatus, combined with a steam brake, for tipping or shooting coal and other minerals from trucks or waggons. It consists of a platform with travelling rails and raised sides, to which are fixed trunnions, which support the platform on appropriate fixed bearings, whereon, when empty or with an empty wagon upon it, it is so balanced as to maintain or recover a horizontal position; but when the wagon is laden, the weight of the mineral comes in advance of the trunnion centres, and imparts a tendency to tilt forward and upset the load. To the fore end of the platform is fixed a long projecting shoot, and the other end communicates with the rails of the road. Attached to the underside of the platform there is a large toothed segment, which engages with a tooth pinion fixed upon the shaft which carries the brake wheel. The brake strap, which passes round the wheel, is made fast to a fixed link stay at one end, and at the other end to the extremity of the piston rod, the axial line of the cylinder being level with the under side of the wheel. The steam valve rotates in a cylindrical steam box, and by means of rods and bevel wheels obtains its required movements by means of a handle on the platform above. The upper side of the piston is in constant communication with the boiler, and when the opening is brought coincident with the steam passage leading to below the piston, the inequality of pressure due to the area of the piston rod is sufficient to slacken the brake strap; but when the steam is exhausted more or less from beneath the piston, the constant steam pressure on its upper side is brought to bear upon the brake.

[Printed, 8*d.* Drawing.]

A.D. 1862, September 30.—N° 2655.

WRIGHT, James.—(*A communication from Alphonse Couvreux and Louis Combe.*)—This invention, relating to a portable steam crane, is described as follows:—

" On a stand or framing of suitable weight and strength I " place an engine and boiler, which, through a pinion on the " main shaft, gives motion to a large cog wheel fastened on the " spindle of the drum, on which is coiled the chain passing from " it to the extremity of the jib, and terminating in a hook or its " equivalent in the usual manner. A tie rod passes from the " extremity of the jib to the extreme rear of the machine, by which " means the weight of the boiler, engine, and the machinery, " counterbalances the weight of the substances or materials to be " lifted. The whole apparatus turns on a circular rail round a " pivot supported on a frame. . . . . . The chain is made fast to " the substance or weight to be lifted; the engine being put in " motion coils the chain round the barrel or drum, thereby hoist- " ing the weight. When it has been raised high enough the " the crane is turned round on the circular rail . . . . by means " of a steam cylinder, mounted on the framing and connected by " means of toothed gearing with the axles of the wheels. . . . . " The crane can be transported from place to place by means of " wheels, which can be raised or lowered by the action of a screw, " and when not in use they may be drawn up out of the way of " the circular rail."

[Printed, 10*d.* Drawing.]

A.D. 1862, October 2.—N° 2662.

GILCHRIST, James.—(*Provisional protection only.*)—The object of the invention is to simplify and render more conveniently efficient the mechanical arrangements of steam boring engines employed for mining purposes. To this end " the principal parts " are fitted upon a framing, which is, by preference, mounted

" upon wheels. The parts comprise a steam boiler, winding
" details with actuating cylinder or cylinders, and a cylinder for
" imparting the required reciprocating motion to the boring rods;
" this last-mentioned cylinder, which may be fixed or oscillating,
" is disposed horizontally, and its piston rod actuates the vertical
" arm of a bell-crank lever centred on a fulcrum or on journals at
" a higher level than that of the cylinder, and having its other
" arm projecting horizontally outwards over the bore, and being
" connected to the boring rods. The steam may have access to
" both sides of the piston, its action on both sides, or on one side
" only, being regulated by a suitable valve actuated by hand or
" by the movement of the piston rod itself; or the steam may be
" allowed access to only one side of the piston. The arms of the
" bell-crank lever need not in all cases be at right angles to each
" other, but may in some cases be arranged to suit a diagonal or
" inclined position of the actuating steam cylinder. When the
" boring rods have to be drawn out of the bore, the bell-crank
" lever may be disconnected and turned out of the way."

[Printed, 4*d*. No Drawings.]

A.D. 1862, December 18.—N° 3384.

CLAYTON, John.—This invention relates to the construction of reverberating furnaces employed for heating large masses of iron and steel, and to applying the waste heat from such a furnace to two steam boilers for the purpose of generating steam, such boilers being so disposed over the furnace, that the current of heat passing therefrom takes a direct course through their tubes and flues.

The center portion of the bottom of the furnace is supported on a carriage with wheels, and is capable of removal for the purpose of having the mass of iron or steel required to be heated placed thereon, or to be loaded with the pile or mass of iron or steel on the side of the furnace opposite to that at which the heated mass is operated upon, the movable bottom carrying to and from the furnace, the metal under operation. The bottom of the furnace inclines towards the two ends, in order that the cinders or slag may fall into two waggons placed underneath. The carriage is moved by means of a chain, which may be worked by a steam engine or otherwise.

Modified arrangements are described and illustrated.

[*Printed*, 1*s*. 4*d*. Drawings.]

A.D. 1863, January 7.—N° 61.

AVELING, THOMAS.—The object of this invention is to improve the construction and efficiency of traction engines, and relates chiefly to the arrangements for driving at different speeds, the use of a chain for transmitting motion to the driving wheels, and, for the purpose of holding to the ground, forming round the periphery of each driving wheel a central projection with lateral ribs, extending at intervals therefrom on both sides to the edges of the wheels. A large chain wheel is fixed on the boss of one of the driving wheels, and a chain pinion is fixed on a transverse counter-shaft which is carried by brackets attached to the boiler; in these brackets are also formed the bearings for the crank shaft. By means of two sets of spur gearing on the counter-shaft, and corresponding toothed pinions which slide on the crank shaft, the speed may be either accelerated or retarded, and by having the bearings of the counter-shaft by means of screws adjustable in curves formed in the brackets concentric with the crank shaft, the slack caused by the wear of the driving chain may be taken up, and an equable tension thereon be maintained.

[Printed, 10d. Drawing.]

A.D. 1863, January 13.—N° 114.

BESSEMER, HENRY.—This invention relates to the manufacture of malleable iron and steel, to the furnaces and apparatus employed, to generating by means of the heat from such furnaces steam in steam boilers, and to a modification of the blast engine described in the specification of a former patent dated March 1, 1860, No. 578.

Combining with a converting vessel a receiver which is formed beneath it, and into which the air is forced before entering the tuyeres, the orifices whereof are covered, to prevent the access of the metal before the blast is applied. The converting vessels are removable on wheels to and from the casting pit, and cranes are employed for removing the upper part of one converting vessel over the lower part of another, thereby to facilitate and hasten the process.

Employs a movable bottom with tuyere box attached in such converting vessels as have axial motion, the detachable portion being previously dried or baked, and the motion effected by means of an hydraulic cylinder with rack and pinion. The blast in conveyed through a tube surrounding the axis of the vessel, and is turned on and off by a double cone equilibrum valve, the tuyere box and air pipe being connected by a sliding joint.

Employs a rotatory or reciprocating paddle in the process of mixing, carbonizing, or alloying; covers with loam the surface of the metal whilst in the ladle, to prevent the escape of heat; ascertains the weight of the metal in the ladle and attaches the latter to the crane by suitable apparatus; describes the manner of forming and arranging the orifices in the tuyeres; and employs furnaces with revolving hearths.

The steam boiler employed to generate steam for driving the blast engine and other machinery by means of the waste heat from the furnace, is disposed over the flue or channel which conveys the waste heat and gases from the furnace to the chimney, and by reason of the intense heat the boiler is protected by a thin brick arch, through which the heat passes and radiates upon the boiler, the hot current afterwards returning is conveyed through the flues of the boiler and thence to the chimney.

Combines with the blast engines the hydraulic force pumps employed to move the converting vessels and work the cranes, and also the pumps which actuate the press or presses for shaping ingots and other metallic masses.

Slabs or blooms of malleable iron or steel are pressed or shaped in hydraulic presses, and then cut into slices of the required size previous to the rolling process.

[Printed, 2*s*. 10*d*. Drawings.]

A.D. 1863, February 27.—N° 559.

CLARK, William.—(*A communication from Barthélemy Louvie.*) —This invention relates to an apparatus or pump for raising and forcing water, acting simply by the pressure and condensation of steam, and producing a continuous current. The apparatus, combined with a peculiar arrangement of boiler which supplies itself with water and superheats the steam, consists of two sheet metal cylinders, in which steam is alternately admitted and condensed, and the water is raised by the vacuum produced. The steam is admitted by means of a valve at the top of each cylinder, which valves are opened by means of a float in each cylinder, the floats falling as the cylinders are emptied. "The peculiar arrangement "and application of these floats, form the principal and essential "*feature,*" of this pumping apparatus.

The apparatus for supplying the boiler with water consists of a suitable reservoir placed above or upon the boiler, and by means of a pipe at its base, communicating low down therewith, and having a cold water vessel above it, with pipes descending from the top which dip into the water supply. Another pipe issues from the top of the reservoir, and dips into the boiler, terminating at the water level. Whenever the level of the water falls below the lower end of this pipe, steam passes up into the reservoir, and the water therein being between two equal pressures, will then flow into the boiler. The superheating pipes convey a portion of the heated products of combustion through the steam space of the boiler.

[Printed, 1*s*. Drawings.]

A.D. 1863, March 14.—N° 692.

PAGE, John.—This invention relates to various devices and modifications in the construction of taps and valves, employed for regulating the flow of fluids such as steam, gas, or water.

In one of the arrangements described a hollow conical plug works in a corresponding conical chamber or body; the fluid entering the plug through a side opening is discharged at the end, an important feature consisting in having the opening carried some distance round the plug, instead of being parallel to its axis, so that the tap may be opened gradually, and thereby be applicable for high pressures.

Another modification is described as suitable for a hydrant. " The plug in this case is an inverted hollow cup, into which the " water enters from below, whilst the discharge is by a slot round " a portion of the side into a curved discharge branch. The " spindle of the plug or cup passes upwards through a stuffing " box or plain aperture, and is shaped externally to receive a key " or handle for opening it by."

" In valves or hydrants in which a disc valve piece with a coni- " cal or sperical rim is made to close against an annular seat, " through which the fluid passes when the valve is opened, the " details for opening the valve piece comprise . . . . . firstly, a " spindle projecting through an aperture or stuffing box to re- " ceive a key or handle externally to turn it, but constructed not " to move longitudinally; secondly, a screw into which the spindle " is entered or with which it is otherwise connected so as to turn

" it and permit of its longitudinal movement; and, thirdly, a nut " fixed inside the valve body, and through which the screw works. " The valve piece is attached to or forms part of the screw or " screwed piece, and is moved to or from its seat by turning the " spindle. The passage leading to and from the valve may be " variously arranged, and so that the valve either closes against " the pressure or has the pressure tending to keep it closed. " Similar actuating details may be used in the case of sluice or " sliding valves."

[Printed, 10*d*. Drawings.]

A.D. 1863, March 31.—N° 825.

SMETHURST, John.—This invention relates to compound cylindrical steam boilers, consisting of two boilers, one, a high pressure boiler being constructed within the other, which constitutes a boiler for generating steam at a lower pressure. The furnaces, of which there are three exhibited in one of the drawings, are placed within the end of the high pressure boiler, and thence respectively through separate groups of longitudinal tubes, their products of combustion are directed into a combustion chamber at the rear, whence they return through flue tubes in the lower part or water space of the outer shell or boiler. Each shell or boiler is furnished with a distinct set of fittings, is supplied separately with water, and has its own gauges and safety valve. The steam from the high pressure boiler serves a high pressure engine, which may exhaust into a cylinder of larger dimensions, into the outer or low pressure boiler, or, conjointly with the steam generated therein, into the cylinder of a condensing engine.

In conjunction with the working of compound boilers with ordinary fire boxes when used for locomotives, two small and two larger cylinders are employed, each engine comprising a small and a large cylinder with piston rods acting upon cranks set respectively at different angles on the crank shaft. The small cylinder of each engine will receive high pressure steam from the inner boiler, and either exhaust into the outer boiler or shell, or into the steam chest of its large or companion cylinder, to operate the piston therein in conjunction with the steam from the outer shell. The two end plates serve to inclose both boilers, and each section has a separate steam pipe or dome.

Compound horizontal boilers with vertical furnaces and flues are *described*, together with a variety of constructive details.

From the cylinders of locomotive engines, the exhaust steam may be employed to heat the carriages, and from the cylinders of stationary engines, for heating buildings.

[Printed, 1s. 10d. Drawings.]

A.D. 1863, June 23.—N° 1582.

WINANS, William Louis, and WINANS, Thomas.—This invention relates to steam boilers, and refers to that class of vertical tubular boilers wherein the flue tubes are vertically arranged and fill the body of the boiler above the furnace, the crown or top of which constitutes the bottom tube plate. It consists in leaving an open water space down the center of the boiler free from tubes, and of sufficient size to admit a man to clean the internal surrounding space. The working water level is below the top tube plate, which constitutes the top of the boiler, and the steam chamber, which is a vertical cylindrical vessel surmounted with a man-hole and cover, is set over the central opening in the top tube plate. This steam chamber is inclosed by a smoke chamber, which has a chimney flue eccentrically rising from the top. The form of the boiler however is not material, as the leaving an unoccupied central water space amongst the vertical tubes for the purposes of cleaning, and affording space for the better circulation of the water, alone constitutes the invention.

[Printed, 10d. Drawing.]

A.D. 1863, August 26.—N° 2114.

JOHNSON, John Henry.—(*A communication from Pierre Gardère and Charles Patek.*)—" According to this invention, it is
" proposed to utilise the power derived from the rapid and con-
" tinuous flow of water through pipes obtained artificially, by the
" condensation of steam directed in the form of a jet or jets into
" a vessel or chamber in connection with such pipes."

" In applying this system to the propulsion of ships, it is pro-
" posed to employ one or more sets of pipes running longitudinally
" along the vessel from stem to stern below the water line. An
" opening is made near the bows of the vessel communicating
" with the pipe in the fore part, and another opening is made
" near the stern communicating with the pipe in the after part.
" These two pipes open into a chamber in which a jet of steam is
" directed from a boiler in the direction of the pipe leading to

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" the stern, so that when the steam is turned on a rush of water
" takes place (by reason of the vaccum produced by the conden-
" sation of the steam in the vessel) through the opening at the
" bows along the pipe in the fore part of the ship and into the
" steam vessel or chamber, whence it is expelled by the force of
" the jet along the pipe in the after part of the ship, and issues
" at the stern in the form of a powerful jet of water which has
" the effect of propelling the ship along. In practice, it will be
" advisable to have two sets of these pipes with their steam jets
" directed in opposite directions, so that by bringing one or the
" other set into operation, the vessel may be directed ahead or
" astern as required."

" In applying this system as a prime mover for driving machi-
" nery, the jet of water produced by the action of the steam in
" the steam chamber is directed against the vanes or buckets of a
" water wheel, the water being obtained from a well, reservoir,
" or other convenient source; by this means no natural fall of
" water is required to drive the water wheel."

[Printed, 8*d*. Drawing.]

A.D. 1863, September 1.—N° 2158.

RUSSELL, George.— This invention relates to apparatus for cooking, combined with a steam boiler for obtaining by condensation fresh water on ship board, and for motive power.

A rectangular casing or range is fitted with an oven and hot plate, and the usual openings and covers for cooking vessels. One end of the range contains the oven, and the other the furnace abutting against the end of a tubular boiler. Contiguous to the opposite end of the boiler is an upright cylindrical vessel containing a spiral coil of pipe, wherein the steam from the boiler is condensed by cold sea water, which fills the body of the condenser. Arrangements are made for admitting or forcing air into the spiral coil to mingle with the steam and freshen the water of condensation. If the steam generated in the boiler be used for working a donkey or other engine, the exhaust steam may either be delivered with other steam from the boiler into a receiver in connection with the condenser, or separately condensed. The steam before condensation may be employed to heat cabins. Dampers are provided for sending the fire draught either direct through the boiler, or *previously* through the cooking apparatus.

[Printed, 10*d*. Drawing.]

A.D. 1863, September 23.—N° 2341.

PLATT, James.—This invention relates to a variety of details, modifications, and combinations of mechanism partly applicable to rotatory steam and water engines of the class described in the specification of a former patent, dated January 28, 1863, No. 253, which said class of engines are also applicable as rotary force and lift pumps. It consists amongst other things, in reducing the wear of rotary engines by lessening the lateral pressure on the shaft; this is effected by forming the disc, or that part to which the steam abutment is fixed, narrow in comparison with the width of the cylinder, and lessening the steam ways where they open into the cylinder. The engine is inclosed in a steam-tight casing, kept (when the engine is worked thereby) full of steam; this casing serves as the frame to support the engine, it being provided with stuffing boxes through which the engine shaft passes; the abutment is provided with adjustable packing pieces and inclines, and means are provided for removing the water of condensation from the outer case; the valves or sliding pieces move radially to and from the exis, and a packing ring is employed for maintaining the parts steam-tight between the revolving cylinder and the hollow trunk.

Describes an arrangement for reversing the motion of the engine, and amongst further details, a modification which, instead of having two stems to the valves or sliding pieces, operates with only one (which is connected to the valve by a T-piece), and with only one set of trucks or pulleys to each valve, and one set of cam surfaces.

Instead of steam these engines may be driven by water or other fluid pressure, or by applying extraneous power to drive the shaft, the engines will operate as lifting or forcing pumps.

They may also be worked as condensing engines with low-pressure steam.

[Printed, 3*s*. 10*d*. Drawings.]

A.D. 1863, October 5.—N° 2431.

STANLEY, John Martin, and STANLEY, Jabez. — This invention relates to the propulsion of vessels by the reaction of the sea against currents of water, driven by steam power out of a main tube or passage, which runs direct through the ship below water level from stem to stern. The steam engine employed is combined with an hydraulic cylinder of large diameter and with the engine feed pump; these are horizontally disposed in a line with the steam cylinder which is between them, so that one piston rod carries the three pistons, the steam cylinder being fitted with a stuffing-box at each end. The pistons of the steam cylinder and feed pump are of the ordinary description, working in their respective cylinders steam and water-tight, but the piston in the hydraulic cylinder is a plain disc working without friction against the cylinder sides. At each end of the hydraulic cylinder there is a passage communicating with the main water tube, governed by valves which are not particularly described. The end of the steam cylinder slide valve rod is jointed to a rocking lever, which has motion from an adjustable carrier on the piston rod, whereby the cutting-off the steam is regulated.

When required to turn the vessel or change her course, by means of valves, lateral branch passages are opened in the main water tube at the stem and stern, and when required to back astern, the engine is reversed, so that the water is then discharged at the fore end of the ship.

A modified arrangement of steam engine combined with a rotary hydraulic apparatus is partly described; it comprises a vertical cylinder, which is mounted upon the circular casing of the apparatus and gives motion, by means of outside connecting rods, to its central shaft, which carries four gyrating piston plates, that set the water in motion through the main tube.

Another modification is described which comprises a rotating shaft mounted eccentrically through a circular case, wherein, diametrally sliding through the shaft, is a piston plate which produces the required water current, motion being imparted from the engine to the shaft by gearing, or by straps and pulleys.

Another modification operates upon the water with oblique blades.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1863, October 5.—Nº 2432.

TOMLISON, CHARLES.—(*Provisional protection only.*)—This invention relates to taps, cocks, hydrants, and valves for regulating the flow of water, steam, air, gas, and other fluids.

Describes a tap which opens and closes by the motion of a valve *or plug*, governed by a wedge or conical-ended stem, screwed or pressed on or into a recess in the plug, so as to cause the latter to move and open the tap either with or against the pressure or flow of the fluid. The valve face and seating may be ground to a true surface, or in order to prevent leakage when the valve is closed, it may have leather or other material interposed. The stem may be actuated by a screw, by pressure, or otherwise, and to prevent any escape of the fluid, it may be passed into the body of the tap through suitable diaphragms, cup leathers, or a stuffing box, in which the packing is inserted between two rings of metal, gutta percha, or other material pressed together by a screwed cap, having holes in its rim to receive stud pins.

This arrangement of tap is modified by forming a valve at each end of the plug.

In addition to the above, the invention includes a multiform variety of taps, valves, plugs, and hydrants, too numerous to describe within the limits of an abridgment; also various modes for connecting stand pipes to hydrants, plugs, air-cocks, taps, and valves; also stand posts and valves devised to prevent freezing of water, and ball or float cocks, also double-faced and other valves.

[Printed, *4d.* No Drawings.]

A.D. 1863, December 11.—N° 3126.

WEBB, THOMAS.—The object of this invention, which relates to engines for hauling agricultural implements, and to traction engines generally, is to increase their tractile power by driving, not only the hinder carrying wheels, but also the leading or locking wheels in such manner as to leave them free to lock and to rise and fall independently whilst passing over uneven ground. This result is effected by a nipping drum, which also serves for hauling the implements. The locking " wheels are made to turn " freely on the axle, which is made with a boss or enlargement " in the centre, serving as a bearing for a vertical axis, the two " ends of which are also held in bearings in a forked piece. This " forked piece has a horizontal stem, which is held and able to " turn in a bearing fixed to the engine. By the turning of the " horizontal stem of the forked piece in its bearing, the wheels " are allowed to rise and fall independently, to follow the inequalities of the land travelled over, and the locking round of " the wheels is obtained by the movement of the axle about the

" vertical axis. For driving the wheels a small nipping drum " is mounted on the vertical axis before mentioned, and this is " driven by an endless rope passing around it and also around " the main nipping drum. On the same axis two bevilled " wheels are also mounted, the one under, and the other over " the axle, and they gear with other similar bevilled wheels fixed " on tubes which are able to turn freely on the axle, and these " tubes at their outer ends are capable of being clutched with the " wheels. Thus when the main nipping drum is driven it rotates " the two leading wheels without interfering with their locking " motion, and when required for rapid turning one or other of " the two wheels may be thrown out of gear. When the engine " is required for hauling, the endless rope is removed from the " main nipping drum. In place of using the main nipping drum " for driving the fore wheels, an extra nipping drum may be " employed for the purpose. Or for the small nipping drums " chain wheels or other gear may be substituted."

In traction engines a similar arrangement may be employed.

[Printed, 1*s*. Drawings.]

A.D. 1863, December 18.—N° 3195.

ADAMS, WILLIAM BRIDGES.—This invention relates to "loco-" motive engines and trains for railways, tramways, and other " roads."

With regard to locomotive engines, the engine and tender are made to form one frame, being hinged together by a vertical joint, so that when rounding curves they have lateral liberty to conform thereto. The steam cylinders may be either placed outside to act on crank pins fixed in the driving wheels, or they may be disposed inside to act on a cranked axle, the driving and other wheels being coupled by outside rods; and to prevent flange-friction, the driving wheels may either be plain without flanges, or the tires of the other wheels may have lateral liberty to slide, direct motion being transmitted from the after wheel of the engine to the fore wheels of the tender by a friction wheel intermediately placed above, so as to rest on their tires, a good portion of the weight of the engine being brought to bear on the axle of this wheel to give it frictional adhesion. The fore axle of the engine, and after axle of the tender run in "radial axle boxes," so that *these axles* when rounding a curve, point to the center. The buffer beams have curved ends, and are otherwise modified. Radial axle boxes are also applied to the carriages. A connected system of brakes throughout the whole train may be operated by the piston rod of a steam cylinder placed beneath the engine foot plate, or by friction from the periphery of the wheels.

The invention further consists in constructing wagons without steel springs; the employment of bogie under frames; hollow wheels cast in two parts and bolted together to contain oil; wheels with tires having liberty to slip round; and general constructive details, including a mode of using petroleum or other mineral oil as liquid fuel, by injecting it in combination with compressed air into the engine fire-box upon the incandescent substances therein.

[Printed, 1*s*. Drawing.]

A.D. 1863, December 21.—Nº 3216.

CLARK, William, and BATHO, William Fothergill.—This is an invention of steam worked machinery for rolling macadamized or other roads; it is also applicable to other purposes. It comprises a vertical multitubular boiler and steam engine with two cylinders mounted on a framework or platform supported by the axles of three broad wheels or rollers after the manner of a perambulator, the front roller or wheel consisting of three parts, collectively the width of the space between the hind rollers; each part is loose on the axle, the center part being the largest in diameter is placed on an eccentric part of the axle.

" The steering apparatus, of which the front roller forms part, " consists of a horizontal ring or turntable which encircles the " three parts of the roller and carries the axle bearings, the said " table being free to revolve on antifriction bowls placed so as to " support the vertical weight and resist the lateral thrust. We " employ suitable gearing for enabling the steerer to turn the " turntable and front roller, and to render this operation as easy " as possible the front axle is turned partly round by means of a " worm and worm wheel, so that the eccentric portion of the " axle shall raise or relieve the two outer parts of the front roller " from contact with the ground, and place the weight of the " front end of the machine on the central part of the said roller. " The hind rollers or wheels have separate axles, and are each in " two parts, the inside parts serve as driving wheels, and are " larger in diameter than the outside parts, and each inside part

" works upon an eccentric portion of its corresponding axle, and
" for raising the outside parts from the ground when required,
" worms and worm wheels are employed similar to those for
" raising the outside parts of the front roller."

The machine is driven by an endless metal chain embracing a chain pinion on the engine crank shaft, and a chain wheel fixed to the largest part of one of the hind wheels or rollers. By disengaging the chain the machine will act as a stationary engine, and by turning the axles and thereby bringing the whole weight to bear only upon the larger portions of the wheels, it will constitute a traction engine.

Printed, 1*s*. Drawings.]

A.D. 1863, December 24.—N° 3260.

MARSDEN, WILLIAM, and STUBBS, FRANCIS HENRY.—(*Provisional protection only.*)—The object of this invention is to increase the tractile power of locomotive engines on railways and common roads by increasing the adhesion of the wheels, and to effect it in such manner that it is under the control of the engine driver. It "consists in applying to a locomotive engine a lever
" or levers, to which may be applied portable and adjustable
" weight or weights, the fulcrum being in any convenient part of
" the framing thereof. The weight employed may be the tender,
" or a portable weight or weights carried thereby, or water from
" the tank may be employed, or a spring or springs attached to
" the tender may be applied to the said lever or levers. The said
" weight or weights may be brought into action on the said lever
" or levers by other levers and connecting rods and screws or
" segment wheel and worm shaft so applied and arranged as to
" be actuated by a hand wheel. By these means or appliances
" additional weight may be placed on the engine, consequently
" producing greater adhesion of the wheels to the rails or road,
" or increased tractive power to such engines."

[Printed, 4*d*. No Drawings.]

A.D. 1863, December 24.—N° 3266.

DUCKETT, JAMES.—(*Provisional protection only.*)—This invention relates to arranging kilns for burning bricks and earthenware, and to employing the heat passing from such kilns to generate *steam in* boilers communicating therewith. "When the bricks or

" other articles in the first kiln have been burnt, the dampers are " opened to admit the products of combustion and heat from the " top of the first to the top of the second kiln, and then from the " second to the third kiln, or the heat from the kilns may be " taken through the flues to the steam boiler or boilers, from " whence it passes through a series of flues under the floor " of the shed to the chimney, or the heat may be conveyed direct " from the kilns to the series of flues in the shed, or partly to the " boilers and partly to the shed, or direct to the chimney. By " thus conveying the products of combustion from the kilns to " the furnaces of the boilers, or to the furnaces for heating the " shed, and thence to the chimney, a powerful draught is obtained " which enables me to consume the cheapest refuse of coal or slack " instead of good coal as now customary."

[Printed, 4d. No Drawings.]

A.D. 1864, January 7.—N° 44.

BASSET, ANDRE MARIE, and LAMOUREUX LOUIS NICHOLAS DESIRÉ.—This is an invention for obtaining increase of power by means of levers and wheels or pulleys and ropes. The inventors say,—" Our invention relates to the construction of a machine " for increasing the power of any kind of rotary engine by the " application of a lever, the power of which is increased according " to its height; thus with a lever two feet long we obtain one-" horse power, one man being sufficient for working our machine. " If we double the height of the lever, not having more resistance " to overcome with a four-feet lever than with one of two feet, " double the power of the lever of four feet is obtained in full, " and which overcomes the increased resistance." And as applied on the principal of a windlass, "if a man can raise a weight with " a wheel of two feet diameter he will raise double the weight " with a wheel of four feet, and will treble and quadruple the " force by increasing the diameter of the wheel."

That the loss of effective motion is proportionate to the power gained by increased leverage seems to have been overlooked.

[Printed, 8d. Drawing.]

A.D. 1864, January 16.—N° 123.

SHANKS, ANDREW.—This is an invention of a steam rivetting apparatus, applicable to the construction of boilers, girders, iron ships, tanks, and similar works. It is mounted on a slide which, by the aid of a rack and pinion, is caused as the work progresses to traverse a horizontal foundation similar to the bed of a lathe; it consists of two parts, one part comprising the rivetter, to which the other is presented in a direct line to react upon the rivetting head. The rivetting head is carried by the piston rod of a piston which works to and fro in a small cylinder to which, by means of a flexible pipe, the steam is admitted by a valve, operated by a hand lever and cam, to force back the piston after each successive blow, and cause the compression of the air behind the piston in the back end of the cylinder, which air drives the piston forward to deliver a fresh blow the moment the exhaust valve is opened. The opposing body or holding-up dolly is also formed on the end of the rod of a piston in a small steam cylinder which is disposed in a line with the rivetting cylinder; the object being operated upon is between the ends of the two piston rods, and steam at the back of the dolly cylinder constitutes the resisting force.

As described in the Provisional Specification, the rivetter is made portable to be carried by the workman, and by the aid of a flexible tube is worked either by the pressure of compressed air or steam.

[Printed, 1*s*. Drawing.]

A.D. 1864, March 26.—N° 763.

SYMES, James.—This invention of locomotive apparatus is described as follows:—" I construct a spherical vessel or globe
" of iron of any required dimensions, say, fifty feet in diameter.
" This hollow globe is to be furnished with an axle passing
" directly through its centre, to which axle a boat or other re-
" ceptacle is slung; this receptacle is also built of iron, and if it
" be formed of a spherical shape, its upper half may be of zinc
" or other light material sufficient for a covering to protect the
" inmates from draught and cold. A steam engine" and boiler
" of about thirty horse-power is to be fixed in the suspended
" receptacle or chamber so as to propel the axle in the globe,
" causing the globe to revolve around the chamber, which remains
" level and dependant from the axle; an opening is made on
" each side of the globe for ingress and egress, and for ventilation
" and the escape of steam or smoke. The interior "is fitted
" either for carrying mails or cargo," fuel, crew, and passengers.
" The axle or shaft extends beyond the periphery of the spherical

" vessel, and serves to sustain a chamber for the steersman, " who operates with a rudder suspended therefrom. On sea " the vessel would draw about 10 feet of water, and would " roll or revolve over the surface with great rapidity. The " vessel would also be applicable for discovering the sources of " large rivers or for exploring and traversing sandy deserts. In " the latter case, the propelling action would be the same as for " water passage, the apparatus revolving along the surface of the " ground, but the steering would be accomplished by means of " guide wheels let down as trails in place of a rudder, which " would be removed and secured in the interior of the apparatus." " For land purposes, trailing wheels could be attached to the " axle, and turned to any desired angle by chain or other " gearing so as to guide the locomotive apparatus in any desired " course."

[Printed, 8*d*. Drawing.]

A.D. 1864, March 31.—N° 798.

MARTIN, WILLIAM, and HODGSON, JOSEPH.—The object of this invention, which relates to a reciprocating semi-rotary steam engine, is to make all the steam available by causing it to act simultaneously between and upon two pistons, thereby to dispense with the resistance which, in the ordinary reciprocating steam engine, is alternately afforded by the cylinder ends.

The cylinders employed are similar to an ordinary engine excepting that the induction ports extend lengthwise and open into the cylinder at the opposite sides of the axis, and there is a stuffing box at each end, each box admitting a shaft whereon the two pistons are respectively mounted, reaching from end to end of the cylinder and working one on each side to and fro round the space between the ports; meeting at each port alternately, they are separated and driven in opposite directions by the incoming steam, the two ports being put into communication with the exhaust passage by an ordinary slide valve. Two of these cylinders are disposed so as to be able to act with conjoint action; the piston shafts having crank arms fixed on their outer ends, by means of connecting rods impart rotary motion to a crank shaft whereon are the eccentrics for working the valves.

[Printed, 10*d*. Drawing.]

A.D. 1864, June 8.—N° 1424.

JOHNSON, John Henry.—(*A communication from Joseph Harrison, the younger.*)—This invention relates to the mode of forming or manufacturing the "units of construction" employed to construct steam generators, also condensors, boilers, and hot water apparatus. These "units of construction" are described in the Specification of a Patent granted to this patentee, and dated August 30, 1859, No. 1970, but instead of being as therein represented, made of cast iron, they are now moulded or stamped by means of suitable dies and matrices out of malleable iron or other metal.

"The two halves of the 'units of construction,' whether com-
" posed of one, two, or more globular chambers, are stamped
" separately, and then secured together by welding, rivetting,
" bolting, brazing, or otherwise, a flange or projection being left
" round the junction edges or largest diameter of each half to
" facilitate the uniting of the same."

"It is proposed to make the 'units of construction' (whether
" such 'units' are cast in moulds or stamped) so as to comprise
" three or more chambers in a row with the view of having a
" double overlap for breaking joint in the building up of a boiler
" with such units. By these means greater strength is obtained
" in boilers built up of such units, as at each overlap there will
" always be at least two chambers and two through bolts in a
" direct line to withstand the strain upon the overhanging or
" projecting portion of such overlap unit."

[Printed, 8*d*. Drawing.]

A.D. 1864, June 23.—N° 1585.

TURNER, Edward Rush, and TURNER, Frederick.—This invention, relating to traction, locomotive, agricultural and other portable steam engines, is applicable to such engines as have a locking motion in front, and consists in extending the upper plating of the boiler beyond the fore end, for the purpose of carrying the vertical shaft by which locking of the front wheels is effected. The arrangement for the locking motion may be varied, but that which is preferred consists of a screw wheel or a segmental part of a screw wheel, which is fixed on the vertical shaft and is actuated by means of a worm. By thus extending the upper part of the fore end of the boiler, space beneath is obtained for the use of wheels of large diameter.

[Printed, 10*d.* Drawing.]

A.D. 1864, August 11.—N° 1995.

RUSSELL, James.—The object of this invention is to effect the rimming, widening, or fairing rivet holes in the plates and other parts of steam and other boilers and structures. This operation which is usually performed with a hand tool is, according to the present invention, effected by a tool fixed in the end of a horizontal spindle or tool holder, which is suitably mounted to slide longitudinally in bearings, and obtains rotary motion by means of bevel wheels and appropriate shafts, from the connecting rod of a small steam engine cylinder attached to the framework. The apparatus thus far may constitute a separate machine for the special purpose above named, or it may have combined in the framing, the necessary arrangements for mounting the details of rivetting and also punching apparatus.

The rimming tool slightly tapers towards the end, and has three longitudinal grooves reaching to the point, and the longitudinal movements of the tool holder or spindle whilst revolving are effected by the workman by means of a hand lever, the hole in the bevel wheel which it carries, being grooved to slide on a feather fixed along the spindle, which causes it continuously to revolve.

Machines may be constructed to carry two rimming tools.

[Printed, 10*d.* Drawing.]

A.D. 1864, September 21.—N° 2316.

SCOTT, George, junior, and TUDOR, James.—This invention has for its object the economical production of "salt cake," which is effected by utilizing the heat from a salt cake roasting furnace, which heat usually escapes into the atmosphere. To this end, a steam boiler is so placed contiguous to the furnace, that the heat passing therefrom is caused to pass through the flues and parts of the boiler, and thereby generate steam from the water therein. The steam is carried through the roasting furnace by means of a pipe bent backwards and forwards therein; this pipe conveys the steam, which becomes superheated whilst passing through the furnace, to heat a decomposing pan, wherein the common salt is rendered into sulphate of soda by sulphuric acid. This pan is constructed with a double bottom or jacket, forming a closed intermediate space beneath the bottom of the pan. The superheated steam fills this space, and the heat whilst the process goes on is indicated by a pyrometer, and kept uniform by the attendant by means of cocks and dampers under his control.

[Printed, 8*d*. Drawing.]

A.D. 1864, October 17.—N° 2565.

NEWTON, William Edward.—(*A communication from Alban Crocker Stimers.*)—This invention relates to the disposition and varied size of the tubes employed in the construction of marine steam boilers, the object being to provide a free upward passage for the steam, as it is generated by contact of the water with the outer or heating surface of the tubes. To effect this, the holes which are made in the tube plates to receive the tubes are made in vertical rows, and the holes in each row decrease in size successively from the bottom, which is the largest, in regular gradation to the top or smallest hole in the row, so that when tubes, corresponding to the different sizes of the holes in the plates are fixed therein, free vertical water spaces increasing in width from the bottom to the top, are formed between the several rows of tubes in a group, offering free passages which gradually widen, for the upward flow of steam, the object being to provide space increasing in proportion or approximately to the increasing volume of the steam as it rises to the surface. A range of tubular boilers containing five furnaces, and having a group containing eight vertical rows of horizontal tubes over each furnace, is illustrated and described. The form, size, or construction of the boiler is not material, so long as the tubes employed in the several rows gradually diminish in size from the bottom to the top tube of each row of a group or series.

[Printed, 10*d*. Drawing.]

A.D. 1864, November 7.—N° 2748.

ESTOURNEAUX, Adolphe, and BEAUCHAMPS, Louis.—This invention relates to the manufacture of a non-conducting composition, to be used for preventing the radiation or transmission of heat or cold, and suited for coating steam boilers and cylinders, pipes, and other apparatus liable to the loss of heat by radiation, or as a covering for pumps, vessels, and utensils containing water and liquids requiring protection from cold and frost.

The non-conducting composition consists of 30 parts by weight of slimy glutinous earth free from sand; 30 parts by weight of wood charcoal powder; 25 parts by weight of fire-brick clay; 7 parts by weight of rye flour; 5 parts by weight of boiled linseed oil; 3 parts by weight of cow hair, and 20 parts or thereabouts of water. The slimy glutinous earth, fire-brick clay, boiled linseed oil, cow hair, and the water are first to be well mixed together in a suitable vessel furnished with a stirring apparatus; when well soaked and united and whilst being stirred, the powdered charcoal is to be added and then the rye flour, the mixing being continued until the whole forms a plastic mass; it is then ready for use and may be applied to the exposed surface of steam boilers, cylinders, vessels and apparatus, after the manner of coating ceilings or walls with plaster or cement. The quantity of each ingredient and the thickness of the coating may be varied according to circumstances.

[Printed, *4d.* No Drawings.]

A.D. 1865, May 16.—N° 1358.

MONTGOMERIE, Walter.—The principal object of this invention is to obtain increased weight upon the driving wheels of locomotive engines, which is effected by making a portion of the weight of the tender available for the purpose. According to one modification, the after end of a small tender is mounted upon an ordinary pair of wheels, and its fore end rests upon and is connected to the contiguous end of the engine by means of a vertical joint pin, the parts being hinged together so as to allow the necessary lateral swinging motion without any vertical play. Various modes of attachment are devised, differing respectively in detail according to the class of engine to which the invention is applied.

"Locomotive engines may also have ordinary long tenders
" connected to them in the same way, so as to render a part of
" the weight of the tenders available on the driving wheels; and
" when it is considered desirable to give a certain vertical elasti-
" city to the combined locomotive and tender, the lower connec-
" tion may consist of an inclined strut, having its lower front end
" connected to the locomotive framing, whilst its upper back end
" is connected to a spring or springs within the tender framing.

" The elasticity of the connection, as well as the proportion of the
" weight transferred, will then depend on the spring, and can be
" modified as may seem desirable by adjusting the spring."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, October 5.—N° 2563.

FRASER, ROBERT WILLIAM.—This invention relates to propelling and steering steam-ships and vessels, and to the apparatus employed for the purpose. The propellers employed, according to one modification, consist of two rectangular plates or boards, one on each side of the stern post. These boards or propellers are carried on the ends of horizontal shafts, which respectively have longitudinal motion imparted to them by the piston rods of two steam engine cylinders, horizontally disposed on the same plane as the propeller rods, one on each side of the line of the keel. These cylinders are caused to act conjointly by means of a horizontal lever, which vibrates on a vertical centre or stud, and has its ends connected, one to each propeller shaft, by short connecting rods. The propellers acting alternately in a backward direction flat against the water, move the vessel forward, and when drawn forward by the return stroke, are turned edgewise by feathering rods; these rods, which are worked by tappets on the piston rods, may either pass through the propeller shafts, which according to this modification are made tubular for the purpose, or they may pass out through suitable stuffing boxes, or, as described in another modification where only one engine cylinder is employed, they may be connected to the ends of a crosshead carried by the back end of a piston rod, the fore end also carrying a crosshead, to the ends of which, connecting rods that give motion to the propeller shafts, are respectively coupled.

The necessary mechanical apparatus for backing astern, and steering by the action alone of one or other propeller, is placed under the control of the steersman on deck. Modifications in the details are also proposed and described.

[Printed, 1*s*. Drawing.]

A.D. 1865, December 9.—N° 3179.

BARCLAY, ANDREW.—This invention, relating to apparatus for injecting, ejecting, and raising water and fluids, is supplementary to prior letters patent granted to this inventor, and bearing date May 6, 1864, No. 1151. Various modifications of the present invention are described, possessing the means of regulating the flow of steam from the steam nozzle, and the opening for the flow of water. To this end, the portion of the apparatus which contains the steam and water nozzles, is furnished towards the upper end with a projecting flange, corresponding to a flange which projects from and forms part of a tube, extending downwards into the body of the instrument and leaving around it an annular space, whilst the portion of the tube above the flange is screw-threaded, and is used for partly regulating the feed. These flanges are held apart by intervening pillars. On the main portion of the instrument there is a stuffing box furnished with a gland that embraces a tubular piece, on the lower end whereof is formed the steam nozzle, which is caused to advance or recede by a hand wheel on the screwed portion of the screw-threaded tube. The spindle by which the flow of steam from the nozzles is regulated, is made tubular to receive an inner spindle furnished with a conical end, which passes down into the water nozzle for the purpose of enlarging or diminishing the area of the water opening. The valve in the throat of the apparatus is so curved, that by means of its form and the back pressure of the feed water, its area of opening can at any time be made to correspond with the opening of the water nozzle.

Modifications and other modes for varying the openings in the nozzles are described.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1866, January 19.—N° 181.

CLARK, WILLIAM.—(*A communication from Alexandre Bobrownicki.*)—(*Provisional protection only.*)—This invention, relating to apparatus for obtaining motive power in a direct manner by the force of steam or gas, is intended to constitute a motor which, it is stated, serves to communicate continuous motion in a given direction. The apparatus, of which there are two modifications, consists of a cylinder formed internally of two diameters and partly inclosed within a casing or jacket. The piston is formed with a projection round one end, the circumferential periphery of which is packed and acts fluid-tight in the largest section of the cylinder; this end of the piston has a deep recess and is open to the atmosphere. The other portion of the piston is equal in diameter to the smallest end of the cylinder which is closed; the force of the steam or gas, which is admitted through this closed end, acts between it and the small end of the piston, round which there is a suitable packing, and the exhaust escapes through a central passage, which opens at the end of the piston and branches out at the sides, so as to correspond at the proper time with side openings in the cylinder. In the larger section of the cylinder a vacuum is formed at each outward stroke of the piston; this vacuum effects the return stroke. The mode of applying the power is not clearly defined, but the proposed advantages of this newly constructed apparatus are elaborately set forth.

[Printed, 8*d*. Drawing.]

A.D. 1866, April 25.—N° 1158.

COCHRANE, Arthur Auckland Leopold Pedro.—This invention, relating to "apparatus for heating and evaporating "liquids and fluids," is partly supplementary to prior letters patent granted to this inventor, which bear date August 24, 1864, No. 2088, and consists of improvements in the working of the boilers described in the second part of the Specification of the said prior letters patent, the objects for attainment now being, to insure the complete combustion of the gaseous and other products evolved by the burning fuel, lessen the production of smoke, and increase the evaporative effects of a given quantity of fuel. To obtain these results, the atmosphere in a heated state is, by means of pipes which pass along the brickwork in the ash-pit and discharge through numerous perforations, introduced in a continuous current into the combustion chamber at the rear of the furnace, wherein flame is developed before the gases are cooled by contact with the outer surface of a group of vertical tubes, which connect the upper and lower sections of the boiler, and between and amongst which the flames and hot draughts take their backward course to the smoke-box and chimney flue. A jet pipe, emitting steam from the boiler, is concentrically placed in each air tube to keep up and hasten the current of air.

[Printed, 8*d*. Drawing.]

A.D. 1866, August 15.—N° 2091.

DE RUSETT, Edwin William, and DALE, Richard Farrell.—This is an invention of a self-acting steam pump or apparatus for raising water, which is lifted by forming a vacuum in the pump cylinder, wherein steam is alternately admitted and condensed by jets of water or otherwise. "We admit steam or " other vapour (say, steam) into a chamber or cylinder; this " steam condenses in the cylinder and causes a vacuum, which is " filled up by water or other liquid entering the chamber through " a suction valve or valves. As the liquid rises in the chamber it " causes a float therein to rise with it until the float comes in " contact with a stop or tappet, which operates on a valve or " valves for again letting in steam to the chamber, so as to drive " the liquid from the chamber through an outlet valve; the float " falls with the liquid until it comes in contact with another stop " or tappet, thus closing the steam inlet valve, when vacuum is " again formed by means of a jet of water or other means for " condensing the steam, and the same action occurs as before " described. The liquid may leave the chamber by ordinary " delivery valve or valves with or without an air vessel and rising " main, or the chamber itself can rest on a seating, when the " pressure of the vapour will cause it to rise, and thus it will " permit the liquid to escape. If more than one chamber be used " they may be made to balance one another." By using two or more cylinders a steady discharge may be obtained.

Describes various arrangements for pumps with one or more cylinders designed to operate on the principle above described, and also some of the various uses to which such pumps may be applied; including the filling of locomotive tanks, as bilge pumps on board vessels, and for propelling vessels by the re-action of the sea water against currents of water discharged outside the vessel by these pumps; some of the arrangements of pumps are provided with a plunger for working by hand, and others are combined with a small engine whereby to work the valves. In some cases the cylinders are enclosed by jackets containing air.

[Printed, 2*s*. Drawings.]

A.D. 1866, September 3.—N° 2259.

CADDICK, David. — This invention, which supplements a patent of earlier date, granted to this inventor July 19, 1865, No. 1882, relates to the construction and working of melting, puddling, and similar furnaces, with a view to the protection of the exposed and other parts of such furnaces from the destructive effects of the fire, and the workpeople employed from the radiating heat. Certain parts of these furnaces such as the doors, door frames, dampers for the necks of furnaces, bridges, plates, and parts not included in the previous patent, are made with hollow channels or passages, through which constant streams of water are caused to flow, for the purpose of lowering the temperature of those parts, the excessive heat being carried off by the water; the floor plates surrounding such furnaces are made hollow and kept cool in the same manner. Perforated plates are employed to supply streams of water, which are caused to flow over the inner and outer surfaces of the front plates to the jamb blocks or "boshes," and thence to the bridge plates.

The heat which escapes from the furnace with the products of combustion is utilized, by causing it to pass through the flues and over the heating surfaces of steam boilers. These boilers are of the vertical class, are variously constructed and fitted with ordinary feed pipes, safety valves and indicators, and in most cases are more or less built in the brickwork of the furnace, or placed on columns contiguous thereto.

[Printed, 2*s*. Drawings.]

SUPPLEMENT B.

A.D. 1861, October 9.—N° 2514.

SIEVIER, Robert William.—This invention relates to the construction of floating batteries, to be built with iron, propelled by steam power, and used for the purposes of war. The upper deck is covered in by a curved armour-plated roof, which is extended beneath the water line, representing an object when afloat similar in form to the back of a broad fish without the dorsal fins, so as to present at all points a curved surface to the enemy's shot. The stem beneath the water line projects forward and forms a ram, and for the means of propulsion one or twin screw propellers are to be fitted in the usual manner astern, or by means of a screw a current of water may be forced out of a tube against the external water. The manner of mounting and working the guns, and the general constructive arrangements are fully described, together with full details of the plans to be adopted for the safety of the crew, and a variety of means for offence and defence, including the ventilation of the battery, and mode of excluding for a time the external atmosphere when it is charged with pernicious vapours, or when, in rough weather, the waves break over the vessel.

The steam boilers, tanks, and air vessels are to be disposed in any convenient position, and a pair of direct-acting steam engines are to be placed low down in the stern.

In some cases compressed air heated by steam is to be employed for discharging from mortars missiles containing inflammable matter, and guns under water are to be discharged by electricity.

Lead, whence from its greasy nature the shot will glide off, is to be employed as an external covering to the armour plates, and shields for land batteries, constructed with metallic plates, are also to be covered with the same metal.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1862, March 26.—N° 840.

GRIFFITHS, Robert.—(*Provisional protection only.*)—This invention, relating to naval warfare, consists :—

1st. In fitting through the stern or other part of a vessel of war, beneath the water line, a projecting bolt or ram, to which a quick to-and-forth motion is to be imparted by means of steam power, after the manner of working steam hammers, for the purpose of piercing holes below water in the hull of an enemy's ship.

2nd. Relates to the construction of an elongated projectile or percussion bolt, adapted for piercing armour-plated vessels. These bolts are severally fitted into cylindrical cases or shells containing an explosive compound, which, when the projectile is discharged from a gun, will, at the moment of striking the object aimed at, explode by the concussion and drive the bolt forward, thereby increasing the effect of the blow of the shell by its secondary effect upon that already weakened part of the plate.

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 9.—N° 1013. (* *)

JONES, Josiah, junior.—" Improvements in constructing and " arming ships and vessels." In order that the power of steam may be employed when alongside of an enemy's ship to make a hole therein below the water, provision is made in constructing a ship or vessel, and applying steam machinery thereto, for employing what may be termed a steam battering ram adapted to produce the effect above mentioned. For this purpose at the bow or other part or parts of a ship or vessel suitably constructed to resist projectiles, and be propelled with so much speed as may be, " a ram is or rams are applied ; each ram consists of a shaft " or bar capable of sliding water tight to and fro through the " bow or other part of the ship or vessel. The inner end of " this bar or shaft is in connection with the piston of a steam " cylinder, so as to be worked by steam quickly to and fro in a " similar manner to a steam hammer. If desired the ram may be " made hollow, so as to admit of a shell being passed through it " into the enemy's ship. In order that a ship may be enabled to " fire a projectile through the bottom of an enemy's ship below " the water, when attempting to run an enemy down or otherwise " to come against her, the bow or part of the bow of the vessel is

" so made that it may pass to some extent under the enemy's ship " or vessel, and from this part of the bow an inclined passage " rises to a position above the level of the water so that a suitable " gun or piece of ordnance may, when loaded, be lowered down " so as to come under the enemy's ship, and in contact therewith " or nearly so, and then fire its charge into or through the " enemy's ship. In some cases the bow is at a point somewhat " below the water, made very strong, and with a hollow passage " through it to admit of a gun or piece of ordnance being fired " along the passage and through the side of an enemy's ship or " vessel immediately on the bow striking the enemy's ship, so that " if the damage consequent on the collision is not sufficient to " sink the enemy the discharge of the gun or piece of ordnance " may effectually accomplish this end."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1862, May 17.—N° 1497. (* *)

SIEVIER, Robert William.—(*Provisional protection only.*)— " An improvement in rams for naval warfare." The invention consists in " the application of an independent battering ram or " rams to vessels of war of any class, whereas the battering ram " at present in use consists of a strong prow, which is only " rendered effective by the momentum of the vessel. I construct " and arrange the ram as follows:—On a strong foundation plate " fixed in the vessel I bolt a cylinder in a horizontal position; " this cylinder contains a piston, the rod of which forms the " ram and extends considerably beyond each end of the cylinder. " The front of the rod I prefer to be of steel, so as to act as a " punch. By means of steam or other motive agent and suitable " valves a reciprocating motion is given to the piston and rod, " the velocity thus imparted to the rod or ram, coupled with its " great weight, causes it to act as a destructive engine when " projected against the side of a vessel or battery. The ram may " be placed at the bow or stern of the vessel, or across, if desired. " I prefer to arrange it below the water line, and there may be " several rams in the same battery or vessel. The ram or rod " may, if desired, terminate with the piston, only passing through " the front of the cylinder. The aperture in the side of the " vessel or battery through which the ram is projected, is provided " with a water-tight stuffing box (or other equivalent) which " surrounds and encloses the ram, thereby preventing the ingress

" of water. Vessels or batteries of war acting as rams by their
" own momentum may be furnished with this supplementary or
" independent ram."

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 6.—N° 867.

GEDGE, **William Edward**.—(*A communication from Piérre Jacques Carmien.*)—(*Provisional protection only.*)—This invention relates to the application of steam power to balloons, to effect aerial navigation.

The balloon is maintained in a horizontal position by the weight in the car, wherein are disposed the steam boiler, fuel, water, and other things necessary for the voyage. The balloon is oviform, and is mounted on a central horizontal shaft or axis. The steam engine is fitted on the bearing plate which carries the shaft at the after end, communication with the car fore and aft being effected by means of rope ladders; the lower end of the front ladder is attached to a windlass, whereby the horizontality of the balloon may be regulated. The steam is conducted to the engine through a pipe of aluminium. The after bearing carries the propelling sails, the mechanical apparatus, and the steering gear, which by means of cords is worked from the car, as also when necessary the furling of the propelling sails.

The form of the balloon may be modified.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 24.—N° 748.

GEDGE, **William Edward**.—(*A communication from Pierre Jacques Carmien.*)—(*Provisional protection only.*)—This invention relates to balloons and steam power as applied to aerial navigation. The body of the balloon is cylindrical, coniform in front and hemispherical at the stern; it is formed of a metallic composition very light and strong, the covering being supported by a series of light circular frames carried by a central horizontal axis, to which depends a skeleton frame or car, which carries the steam engine and boiler. The propelling sails, adjusted to a suitable angle, are attached to the after part of the balloon, which has rotary motion imparted to it by means of pulleys on the engine driving shaft and cords or bands, which are adapted to circumferential grooves round the balloon. The rudder is fitted to the fore end. For the purpose of ascending or descending, air is admitted or discharged at the ends of the balloon, and two archimedian screws, capable of being turned in either direction by the engine, respectively to assist in the ascent or descent, are placed in the car; the products of combustion are by means of a pipe discharged at the after end.

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 13.—N° 929. (* *)

BURCHALL, John, and BORROWS, Edward.—(*Provisional protection only*.)—" Improvements in arming war vessels."

" In applying to such vessels an instrument of atttack which we " call a moveable ram, to distinguish it from the rams ordinarily " used, which are fixtures to or on portions of the vessel. Our ram, " on the contrary, is formed to thrust forwards like a punch with " rapid action, which may be repeated in a succession of blows, " so that if the vessel with this moveable ram be sufficiently near " an enemy's vessel it will punch holes in it and so destroy it, or " so bruise it as to render it leaky and unserviceable; and we put " the ram in motion by the agency of steam or chemical gases, or " air, or water pressure, in any of the known modes of applying " power or any convenient combination thereof, and these rams " may be applied above the water line or below it in any con- " venient part of the vessel, stuffing boxes being provided when " the rams are below the water line to keep out the water, and " the rams may be of any desirable section, round, square, oval, " triangular, or polygonal, and flat-headed, pointed, or cupped."

[Printed 4*d*. No Drawings.]

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Ruchet, Vonwiller, and Seiler, 8.
Hancock and Hancock, 229.
Shaw, 1234 (*Supplement*).
Scott, 1236 (*Supplement*).
Sievier, 1287 (*Supplement B.*).
Stewart and Kershaw, 522.
Stanley and Stanley, 718.
Gill, 738.
Laidlaw and Robertson, 780.
Galloway, 787.
Ramsbottom and Blackburn, 807.
De Bergue (*De Bergue*), 818.
Jones, 824.
Watts, 837.
Leatham, 884.
Tongue (*Patan*), 1016.
Newton (*Atwater*), 1041.

Air cylinder for regulating steam hammer:
Winton and Cowan, 1224 (*Supplement*).

Air forced into steam boilers to obtain increased power:
Salmon, 92.
Stevens (*Carrère*), 107.
Westhead, 130.
Olding, 302.
Gallafent, 329.
Bennett, 343.
Blanc, 516.
Galloway, 819.
Taylor, 1063.

Air, gas, and vapour engines, may also generally be actuated by steam:
Stevens (*Carrère*), 107.
Siemens, 114.
Johnson (*Lenoir*), 170.
Johnson (*Prouvost*), 176.
Gjers, 212.
Hancock and Hancock, 229.
Brooman (*Archibald*). 300.
Newton (*Rafael*), 312.
Mennons (*Belou*), 325.
Boneill and Spiring, 331.
Bennett, 343.
Arbòs, 444.
Macintosh, 479.
Hugon, 494.
Stewart and Kershaw, 522.
Clark (*Merlanchon*), 545.
Richards (*Messer*), 612.
Harrison, 621.
De Kercado, 647.
Young and Kirk, 651.
Miller, 685.
Boulton, 695.
Boulton, 696.
Boulton, 709.
James, 716.
Stevens (*Stevens*), 726.
Boulton, 729.
Messer, 732.
Jones, 824.
Watts, 837
Jones, 844
Boulton, 848.
Boulton, 862.
Leatham, 884.
Hancock and Barnes, 899.
Tongue (*Patan*), 1016.
Parker, 1029.
Douglas, 1086.

Air pumps and working gear:
Tuck, 123.
McNaught, 128.
Jack and Rollo, 136.

Air pumps and working gear—*cont.*
Henderson, 142.
Crosland, 147.
Prince (*De Bayelt*), 160.
Davison and Paterson, 199.
Bury, 208.
Hancock and Hancock, 229.
McNaught, 238.
Shaw, 1234 (*Supplement*).
Scott, 1236 (*Supplement*).
Brooman (*Archibald*), 300.
Rippingille, 328.
Johnson, 340.
Kay and Hartley, 362.
Knowelden, 366.
Spencer, 368.
Temperley, 369.
Duntze (*Ashe*), 442.
Hawthorn and Hawthorn, 446.
Spencer, 481.
West, 498.
Blanc, 516.
Pragst, 577.
Slaughter, 592.
Snell (*Yapp*), 599.
Hall, 635.
Hutchinson, 669.
Gedge (*Maumenée*), 684.
Boulton, 695.
Messer, 732.
Crosland, 754.
Knab, 759.
Huch and Windhausen, 769.
Laidlaw and Robertson, 780.
Drury, 782.
Davey, 804.
Watts, 837.
Lungley, 838.
De St. Céran, 877.
Leatham, 884.
Porter, 910.
De Bergue (*De Bergue*), 915.
Lyttle, 918.
Boulton, 923.
Newton (*Isham*), 927.
Boulton, 931.
Orr, 1014.
Taylor, 1063.
Varley, 1137.
Clark (*Bobrownicki*), 1283 (*Supplement*).

Air supplied to furnaces. *See* Feeding air to steam boiler furnaces.

Air vessels (to equalize pressure):
Paterson, 632.
Parod, 681.
Graveley, 765.
Porter, 910.

Anti-friction rollers:
Grimaldi, 237.
Beer, 264.
Grimaldi, 306.
Wood, 415.
Bristol, 921.
Woodbury, 948.
Bowen, 988.
Newton (*Farcot and Perrigault*), 1065.

Atmospheric condensers:
Rickett, 130.
Howden, 150.
Howden, 315.
Campbell, 367.
Slaughter, 592.
Snowdon, 657.
Allen, 662.
Gedge (*Maumenée*), 684.
Thorold, 693.
Fowler and Webb, 713.

Auxiliary cylinders to steam engines:
Barnett, 120.
McNaught, 128.
Livsey (*Leigh*), 529.
Pearce, 1066.
Joy, 1158.

Auxiliary driving wheels:
Crockford, 801.

Auxiliary power, obtaining. *See* Reaction of momentum.

Auxiliary power for starting gear:
Makinson, 1211.

Auxiliary steam carriage:
Lee, 715.

Axle bearings. *See* Bearings for shafts and axles.

Axle boxes:
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Bray, 291.
Jones, 464.
Adams (*Supplement*), 1272.
Henry (*Gellerat and Co.*), 771.
Wilson, 917.

Axles and shafts of engines:
Silver, 65.
Bramwell and Owen, 217.
Hawksley, 1237 (*Supplement*).
Wilson, 278.
Bray, 291.
Death, 389.

Axles and shafts of engines—*cont.*
- Selby, 419.
- Aitken, 456.
- Barclay, 496.
- Morel, 677.
- Cope, 686.
- Lee, 715.
- Wilson, 734.
- Adams, 785.
- Salmon, 802.
- Wilson, 917.
- Fell, 1138.

Ball valves:
- Lessware, 748.
- Johnson (*Lister*), 991.

Beam steam engines. *See also* Steam engines.
- Barclay, 35.
- McNaught, 128.
- Syrett, 140.
- Howden, 150.
- Adamson, 165.
- Mash, 216.
- Woodward, Woodward, and Woodward, 297.
- Scott, 316.
- Cowper, 428.
- Wymer, 475.
- Livsey (*Leigh*), 529.
- Mountain, 646.
- Rowan, 664.
- Jones, 844.
- Newton (*Danford*), 889.
- Low, 917.
- Wheeler, 994.

Bearing and other springs:
- Taylor, 90.
- Moulton, 167.
- Allan, 224.
- Salmon, 802.
- Wilson, 817.
- Wilson, 917.
- Spencer, 1007.

Bearings for shafts and axles:
- Wilson, 278.
- Bird, 1245 (*Supplement*).
- Death, 389.
- Barclay, 421.
- Winans and Winans, 555.
- Hutchinson, 669.
- Lee, 715.
- Adams, 785.
- Millar, 810.
- Brooman (*Loubat*), 919.
- Wheeler, 994.
- Winter, 999.
- Appleby, 1107.
- Gobert, 1180.

Blast engines. *See also* Blowing machines and apparatus; Blowing and exhausting boiler furnaces:
- Johnson (*Fossey*), 1216 (*Supplement*).
- Bessemer, 1263 (*Supplement*).
- Coulthard, 536.
- Holman, 606.
- Beckton, 680.
- Newton (*Smith*), 692.
- Crosland, 754.
- Bennett (*Bassett*), 942.
- Elder, 1046.

Blast pipes:
- Tyrrell, 100.
- Jones, 464.
- Spencer (*Marks*), 722.
- Elliott, 914.
- De Bergue (*De Bergue*), 915.
- Clark, 1107.

Blow-off cocks. *See also* Blowing-off surface water, &c.; Scum dishes, &c.:
- Bousfield (*Renwick*), 113.
- Attwood, 258.
- Green and Green, 280.
- Braddock, 452.

Blowing and exhausting boiler furnaces. *See also* Blast engines:
- Humphrys, 40.
- Delabarre, 42.
- Hydes, 145.
- Arrowsmith, 195.
- Brooman (*De Beauregard*), 304.
- Gallafent, 329.
- Mennons (*De Erlanger and Friedmann*), 397.
- Arbòs, 444.
- Wilson, 478.
- Smethurst, 503.
- Ivory, 590.
- Nicholls, 640.
- Pearson, 667.
- Penrice, 670.
- Beckton, 680.
- Martin, 694.
- Parker, 695.
- Boulton, 695.
- Boulton, 709.
- Robertson, 818.
- Brooman (*De Beauregard*), 908.
- Lyttle, 918.
- Bennett (*Bassett*), 942.
- Lyttle, 976.
- Bennett, 977.
- Clark, 1008.

Blowing and exhausting boiler furnaces—*cont.*
- Elder, 1046.
- Newton, 1052.
- Lyttle, 1083.
- Newton, 1124.
- Newton (*Fisher*), 1133.
- Bousfield (*Thierry*), 1149.
- Lyttle, 1185.

Blowing machines and apparatus:
- Johnson (*Fossey*), 1216 (*Supplement*).
- Blakeley, 74.
- Amos, 370.
- Bessemer, 1263 (*Supplement*).
- Snowdon, 657.
- Beckton, 680.
- Newton (*Smith*), 692.
- Thorold, 693.
- Crosland, 754,
- Gwynne, 775.
- Clark (*de Keravenan*), 779.
- Thrift, 784.
- Bennett (*Bassett*), 942.

Blowing-off surface water from steam boilers:
- Bousfield (*Renwick*), 113.

Bogie or under frames for locomotives and carriages. *See also* Running on curves, &c.:
- Train (*Grice and Long*), 152.
- Johnson, 1229 (*Supplement*).
- Law and Downie, 479.
- Adams, 1272 (*Supplement*).
- Fairlie, 707.
- Adams, 785.
- Woodbury, 948.
- Fairlie, 984.
- Fowler (*Quadling*), 1110.

Boiler plates:
- Jones, 55.
- Austin, 77.
- Ramsell, 136.
- Hydes, 145.
- Austin, 155.
- Davies (*Montgomery*), 158.
- Smyth, 233.
- Newton (*Stevens*), 274.
- Henry (*Gifford*), 282.
- Pendred, 292.
- Adamson and Leigh, 394.
- Redstone (*Redstone*), 395.
- Leetch and Mathew, 406.
- Wilkinson, 469.
- Wilde, 499.
- Jeffreys, 521.
- Taylor, 571.

Boiler plates—*cont.*
- Cochrane, 605.
- Longridge, 673.
- Russell, 1279 (*Supplement*).
- Johnson (*Brown*), 853.
- Wilson, 917.
- Ramsbottom, 929.
- Bonneville (*Bouniard*), 958.
- Heyns, 1204.

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- Pendred, 292.
- Jeffreys, 434.

Boilers. *See* Steam boilers, and steam generators.

Boilers circulating water for heating and other purposes:
- Weems, 53.
- Riddell, 127.

Boilers, open:
- Trayes, 74.
- Newton (*Prindle*), 221.

Boring engine cylinders. *See also* Cylinders of engines:
- Cole (*Woodruff and Beach*), 624.

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Boring and winding engines:
- Barclay, 422.
- Gilchrist, 1261 (*Supplement*).
- Barclay, 495.
- Crease, 603.
- Haseltine (*Burleigh*), 1192.

Brakes and safety apparatus:
- McGauley, 161.
- Law, 175.
- Arrowsmith, 195.
- Wright and Wright, 1225 (*Supplement*).
- Scott, 1236 (*Supplement*).
- McConnell, 1247 (*Supplement*).
- Mennons (*Valini*), 383.
- Barclay, 421.
- Rigg, 1260 (*Supplement*).
- Clark (*Meyer and Meyer*), 461.
- Punshon, 467.
- Fell, 473.
- Law and Downie, 479.
- Morel, 553.
- Fell, 628.
- Adams, 1272 (*Supplement*).
- Morel, 677.
- Clark (Loughridge), 723.

Brakes and safety apparatus—*cont.*
Bird, 777.
Adams, 785.
Salmon, 802.
Galloway, 819.
Mackenzie, 861.
Tolhausen (*Dutheil*), 902.
De Bergue (*De Bergue*), 915.
Naveaux, 915.
Brown, 982.
Burrows and Burrows, 1090.
Phillips-Smith, 1129.
Fell, 1138.
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Bridges of furnaces:
Harlow, 1231 (*Supplement*).
Galloway, Galloway, and Wilson, 252.
Fenton, 265.
Rydill, 294.
Johnson and Morris, 351.
Williamson, 488.
Lockwood, 512.
Robinson, 583.
Cooper, 823.
Cass, 840.
Vuldy, 1045.
Hampton, 1080.
Caddick (*Supplement*), 1285.
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Brushes for cleaning boiler tubes. *See also* Cleaning tubes and flues of boilers:
Walls, 3.
Fletcher, 98.
Johnson (*Dumas*), 358.
Cowper, 428.
Moriarty, 1004.
Bayliss, 1029.

Buckets, cylinders, and pistons of pumps. *See also* Air pumps, Pumps, and Pumping engines:
McNaught, 23.
Skekel (*Skekel*), 100.
Birkbeck (*Ponche, Scellier, and Brasseur*), 191.
Hodgson, 192.
Ridge, 209.
Hewett, 302.
Ripley, 322.
Colburn, 1259 (*Supplement*).
Buckley and Smith, 1104.

Buffers and buffing apparatus:
Allan, 224.

Calcining ores in boiler furnaces:
Bliss (*Wilkinson*), 401.
Stevens (*Stevens*), 726.

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Johnson (*Harrison*), 381.
Korshunoff, 1181.

Cement for fixing boiler tubes:
Barré, 19.
Paviola, 777.

Chimneys and funnels:
Aveling and Rawlinson, 226.
Beattie, 667.
Spencer (*Marks*), 722.
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Cleaning out steam boilers. *See also* Incrustation:
Weems, 53.
Fletcher, 98.
Duméry, 157.
Shepherd and Goodfellow, 238.
Attwood, 258.
Taylor, 259.
Johnson (*Harrison*), 279.
Green and Green, 280.
Hewett, 302.
Shepherd, 310.
Needham, 311.
Brooman (*Friedmann and De Erlanger*), 313.
Topham, 358.
Cowper, 428.
Braddock, 452.
Winans and Winans, 1267 (*Supplement*).
Seward and Smith, 619.
Knowles, 634.
Beattie (*Marks*), 722.
Tyne, Tyne, and Clayton, 946.
Draper and Leech, 977.
Winans and Winans, 1051.
Jordan, 1058.
Turton, 1091.
Tongue (*Miller*), 1170.
Newton (*Bailey*), 1175.

Cleaning tubes and flues of steam boilers and condensers:
Hardy, 1.
Walls, 3.
Belleville, 11.
Barré, 19.
Senior, 78.
Fletcher, 98.
Davison and Paterson, 199.
Elson, 257.
Green and Green, 280.
Grimaldi, 306.

Cleaning tubes, &c.—*cont.*
- Howden, 315.
- Johnson (*Dumas*), 358.
- Hirst and Taylor, 386.
- Redstone (*Redstone*), 395.
- Field, 432.
- Walls, 578.
- Fox, 594.
- Bonneville (*Chaudoir*), 683.
- Lees, 711.
- Amos and Anderson, 817.
- Hare, 897.
- Elliott, 914.
- Green and Green, 945.
- Soutar (*McDowell*), 948.
- Davies (*Egenton*), 968.
- Whitehead, 973.
- Wheeler, 983.
- Brooman (*Belleville*), 989.
- Moriarty, 1004.
- Whitehead, 1026.
- Bonneville (*Chaudoir*), 1028.
- Bayliss, 1029.
- Soutar (*McDowell*), 1040.
- Caithness, Earl of, 1089.
- Green, 1140.
- Twibill, 1150.
- McDowell, 1151.
- Newton (*Bailey*), 1175.
- Robinson, 1192.
- Newton (*Joublin*), 1201.

Clutch boxes:
- Jobin, 301.
- Savage, 423.
- Preger (*Reidinger*), 827.
- Howard and Bousfield, 881.

Coating boiler and condenser tubes. *See also* Protecting boiler tubes:
- Monckton, 318.
- Parkes, 370.
- Adamson, 1006.
- Field and Wise, 1103.

Coating, lining, and covering steam boilers and condensers:
- Hayes, 284.
- Spence, 431.
- Thorp, 453.
- Hargraves, 614.
- James, 622.
- Paviola, 777.
- Estourneaux and Beauchamps, 1280 (*Supplement*).
- Bevan and Fleming, 816.
- Lake, 839.
- Le Roy, 865.
- Boffey and Smith, 955.
- Thys, 971.
- Simons and Brown, 979.
- Jones, 1075.
- White, 1076.
- Korshunoff, 1181.
- Storey, 1211.

Cocks and valves. *See also* Valves:
- Lambert and Wakefield, 36.
- Ridge, 209.
- Burch, 221.
- Roberts and Greenacre, 384.
- Howat, 394.
- Smith, 411.
- Page, 1265 (*Supplement*).
- Clark and Hope, 520.
- Shedlock, 551.
- Pinède, 572.
- Tomlison, 1270 (*Supplement*).
- Smith, 609.
- Rowland, 704.
- O'Neill, 718.
- Weild (*Justice*), 737.
- Ivory, 781.
- Gedge (*Montméja*), 801.
- Wyllie and Gray, 883.
- Jenkins, 919.
- Bennett, 974.
- Moore (*Moore*), 993.
- Walsh, 1002.
- Lewis, 1020.
- Waddell and Muir, 1060.
- Turton, 1101.
- Ghesney, 1111.
- George, 1195.
- Cutler and Brown, 1212.
- Harrison, 1214.

Cog wheels planed out of solid metal:
- Miller, 215.

Coke, charcoal, and other ovens heating also steam boilers:
- Cowan, 1244 (*Supplement*).
- Joseph, 1246 (*Supplement*).
- Joseph, 1247 (*Supplement*).
- Rogers, 736.
- Gedge (*Barbier-Perroton*), 978.

Combined gauges and meters:
- Newton (*Allen*), 22.
- Pullan and Cresswell, 56.
- Walker, 60.
- Warren, 179.
- Searby, 184.
- Pinchbeck, 187.
- Bailey and Bailey, 298.
- Vidie, 352.
- Allcroft, 462.
- Bryant (*Ambrouseus*), 517.
- Saunders, 738.

Combined steam generator and condenser:
- Pascal, 77.

Combined valves. *See also* Valves:
Johnson (*Duvoir*), 83.
Fife, 473.
Johnson (*Ménard*), 742.
Courtauld, 877.
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Combining steam and air to obtain motive power. *See* Motive power, obtaining, &c.

Combining steam boilers:
Rowan and Horton, 24.
Morrison, 30.
Davies (*Verrier*), 44.
Horton and Kendrick, 46.
Weems, 53.
Johnson, 66.
Miller, 80.
Sautter (*Gill*), 120.
Roddewig (*Schmidt*), 223.
Armstrong, 230.
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Field, 432.
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Smethurst, 503.
Smethurst, 1266 (*Supplement*).
Ivory, 781.
Humphrys, 854.
Rydill, 872.
Adamson, 1006.
Ramsbottom, 1049.
Lishman, 1114.

Combining steam engines:
Davies (*Verrier*), 44.
Booth, Booth, and Booth, 439.
Fletcher, 655.
Morel, 677.
Preger (*Riedinger*), 827.
Crosland, 1062.
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Combustion of fuel, there being specialty in the means or the arrangements for:
Bridgett, 60.
Robertson and Ritchie, 73.
Tyrrell, 100.
Howden, 150.
Sykes and Sykes, 161.
Spencer, 171.
Phillips, 206.
O'Hanlon, 251.
Hesketh and Parsell, 263.
Brooman (*de Beauregard*), 304.
Parker, Wells, and Wells, 317.
Howie, 331.
Bonneterre, Erhart, and Monti, 353.
Prince (*Langen*), 424.

Combustion of fuel, &c.—*cont.*
Smith, 462.
Hoyos, 498.
Johnson (*Hébert*), 501.
Thierry, 527.
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Wilson, 586.
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Parker, 602.
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Newton (*Borsig, Freudenthal, and Daelen*), 698.
Palmer, 731.
Cosserat, 741.
Clark (*Duméry*), 789.
Cochrane, 804.
Roger, 814.
Hills, 837.
Beardmore, 877.
Lamport, 889.
Clark (*Fouché and Moret*), 911.
Newton (*Sergeant*), 939.
Sicardo, 964.
Lyttle, 976.
Bennett, 977.
Wilson, 980.
Newton (*Davis, Davis, and Anable*), 983.
Prideaux, 997.
Dow, 1033.
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Clark (*Piret and Michel*), 1080.
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Stevens (*Stevens*), 1097.
Salmon, 1113.
Turner, 1156.
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Wilson, 1164.
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Compound high and low pressure beam steam engines; working the steam twice:
Howden, 150.
Adamson, 165.
Cowper, 428.
Low, 917.

Compound high and low pressure steam engines; reworking the steam and generally condensing:
Walls, 3.
Bevis, 12.
Rowan and Horton, 24.
Wain, 25.
Morrison, 30.
Beardmore and Rigby, 41.
Napier, 43.
Bell, 50.
Gourlay and Kemp, 52.
Wenham, 79.
Barnett, 120.
Sautter (*Gill*), 120.

Compound high and low pressure steam engines—*cont.*
- Macnab, 124.
- Williamson and Perkins, 126.
- McNaught, 128.
- Edge, 131.
- Jack and Rollo, 136.
- Syrett, 140.
- Crosland, 147.
- Howden, 150.
- Mardell, 154.
- Adamson, 165.
- Weallens, 188.
- Humphrys, 198.
- Cass, 202.
- Miller, 215.
- Rollo, 232.
- Dickinson, 269.
- Macnab, 273.
- Holt, 276.
- Woodward, Woodward, and Woodward, 297.
- Selby, 308.
- Howden, 315.
- Scott, 316.
- Macnab, 332.
- Allen and Stewart, 336.
- Humphrys, 351.
- Humphrys, 357.
- Elder, 373.
- Humphrys, 409.
- Glanville, 417.
- Selby, 419.
- Cowper, 428.
- Field, 432.
- Henderson (*McLardy*), 447.
- Delany and Okes, 450.
- Varley and Crowther, 457.
- Milner, 471.
- Wymer, 475.
- Smethurst, 1266 (*Supplement*).
- Smethurst, 503.
- Livsey (*Leigh*), 529.
- Clark (*Melanchon*), 545.
- Pragst, 577.
- Ivory, 590.
- Elder, 618.
- Howden, 630.
- Hall, 635.
- Brookes (*Guyet*), 638.
- English, 643.
- Morel, 677.
- Löbnitz, 755.
- Ivory, 781.
- Brookes (*Vabe*), 824.
- Rooke, 864.
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- Farey, 1022.
- Elder, 1046.
- Crossland, 1062.
- Pearce, 1066.
- Elder, 1114.
- Ramsbottom, 1126.
- Barlow and Dack, 1153.
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- Newton (*Marye*), 1163.
- White (*Ansaldi*), 1180.

Compound high and low pressure steam engines—*cont.*
- Field, 1195.
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Compounds for preventing incrustation in steam boilers. *See also* Incrustration, &c.
- Hughes (*Pichio*), 272.
- Johnson (*Lecacheux and Sartre*), 324.
- Hankins, 325.
- Townsend, Young, and Hankins, 360.
- Delrue, 411.
- Wilson, 424.
- Johnson (*Lecacheux, Sartre, Bernard and Co.*), 431.
- Townsend and Young, 468.
- Terrett, 514.
- Travis, 540.
- Page, 565.
- Page, 622.
- Beattie (*Marks*), 722.
- Sims and Pendley, 725.
- Irwin, 746.
- Abel (*Roubert*), 832.
- Hewitt, 893.
- Routledge and Richardson, 906.
- Hewitt, 946.
- Silvester, 1012.
- Ward, 1024.
- Williamson and Marren, 1028.
- Gray, 1038.
- Harris, 1058.
- Feasey, 1069.
- Haseltine (*Lavo and Chouteau*), 1089.

Compressing air. *See* Air compressing.

Condensation. *See* Water of condensation discharged, &c.

Condensers for locomotive steam engines. *See also* Atmospheric condensers :
- Carter, 14.
- Taylor, 20.
- Sturrock, 526.
- Barron, 546.
- Slaughter, 592.
- Salmon, 802.

Condensers for marine engines
- Newton (*Stevens*), 274.
- Furlonge, 281.
- Mace, 474.
- Hayes, 489.
- Paterson, 632.
- Wright, 678.
- Newton (*Lighthall*), 714.
- Wood, 888.
- Crichton, 1085.

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Moreland, 6.
Spencer, 9.
Harrington, 13.
Rowan and Horton, 24.
Morrison, 30.
Bell and Cutts, 43.
Clark, 53.
Fisher and Fisher, 59.
Macnab, 61.
Johnson, 66.
Fletcher, 76.
Pascal, 77.
Romaine, 82.
Jack, 96.
Miller, 98.
Williamson and Perkins, 121.
Habel, Holzwasser, and Burns, 136.
Jack and Rollo, 136.
Henderson, 142.
Hydes, 145.
Williams, 149.
Prince (*de Bayelt*), 160.
Spencer, 171.
Davison and Paterson, 199.
Cass, 202.
Lamb, 207.
Bury, 208.
Scott, 214.
Miller, 215.
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Brière, 689.
Lees, 711.
Fletcher and Bower, 719.
Craig (*Turck*), 730.
Robinson and Gresham, 788.
Newton (*Riedel*), 941.
O'Neill, 970.
Marshall, 1060.
Marshall, 1062.
Davies (*Quinn*), 1088.
Trotman, 1123.
Abel (*Hervier and Guizot*), 1129.
Haseltine (*Wiard*), 1168.

Feed water, obtaining, purifying. *See also* Filtering, &c.:
Wright (*Gray*), 63.
Mennons (*Gache*), 101.
Spencer, 171.
Cameron, 180.
Farren, 194.
Sykes and Sykes, 202.
Spencer, 240.
Clark (*Lightall and Crystie*), 248.
Chaplin, 1239 (*Supplement*).
De Clercq and Chazelles, 288.
Bousfield (*Wilcox*), 339.
Braddock, 452.
Clark (*Sébillot*), 477.
Whittles, 493.
Johnson (*Bristol*), 620.
Howden, 630.
Martin, 642.
Slack, 658.
Winstansley and Kelly, 659.
Newton (*Judson*), 881.
Newton (*Eames*), 913.
Brooman (*Danjou*), 962.
Toth, 981.
Wheeler, 995.
Gray, 1038.

Feed water, &c.—*cont.*
Newton (*Lansdell*), 1105.
Weatherdon (*Toth*), 1106.
Reade (*Lansdell*), 1118.
Trotman, 1123.

Feed water regulators, registers, &c.:
Thomas, 3.
Belleville, 11.
Rowan and Horton, 24.
Aldred and Maynes, 28.
Routledge, 88.
Fletcher, 98.
Clark (*Joly*), 144.
Wilson, 239.
Romminger (*Möller*), 860.
Newton (*Sellers*), 875.

Feed water, supplying to steam boilers :
Walls, 3.
Moreland, 6.
Auld, 26.
Aldred and Maynes, 28.
Bateson, 33.
Delabarre, 42.
Newton (*Knowles*), 57.
Johnson, 66.
Salmon, 84.
Routledge, 88.
Mennons (*Keifler*), 94.
Davies (*Gargan and Co.*), 95.
Calvert, 118.
Delasalle, 126.
Rickett, 130.
Gedge (*Delcourt, Boulicault, and Maupoil*), 138.
Hunt, 162.
Longridge, 178.
Sykes and Sykes, 202.
Newton (*Rains*), 214.
Homersham, 220.
Allan, 224.
Armstrong, 230.
Leeming, 232.
Grimaldi, 237.
Wilson, 239.
Clark (*Lighthall and Crystie*), 248.
Colburn, 255.
Bousfield (*Chase*), 257.
Colburn, 259.
Rowan and Horton, 260.
Lane, 266.
Newton (*Stevens*), 272.
Wild and Hodson, 275.
Green and Green, 280.
Furlonge, 281.
Hayes, 284.
De Clercq and Chazelles, 288.
Olding, 302.
Monckton, 318.
Clark (*Pradel and Wahl*), 341.
Piddington (*Winter*), 342.

Feed water, &c.—*cont.*

Davis and Davis, 346.
Davies (*Achard*), 377.
Macnab, 410.
Brière, 412.
Cleuet, 413.
Prince (*Langen*), 424.
Auld and Auld, 447.
Chamberlain, 465.
Stewart and Robinson, 476.
Fletcher and Bower, 478.
Clark (*Louvie*), 1264 (*Supplement*).
Whittles, 493.
Barclay and Morton, 499.
Rothwell and Rothwell, 501.
Spencer, 509.
Gray, 524.
Craig, 525.
Day, Lamb, and Summers, 527.
Thomson, 531.
Gleave and Young, 539.
Wagstaff, 548.
Platt, 574.
Ivory, 590.
Wilson and Lindsley, 632.
Brooman (*Jonchier*), 633.
Martin, 642.
Allen, 662.
Gerstenberger, 663.
Newton (*Lathrop*), 668.
Parod, 681.
Brière, 689.
Thorold, 693.
Fletcher and Bower, 719.
Craig (*Turck*), 730.
Bonueville (*Deprez*), 744.
Robinson and Gresham, 788.
Valant (*Valant and Ternois*), 794.
Shaw, 796.
Lungley, 838.
Cass, 840.
Gresham, 842.
Romminger (*Möller*), 860.
Mackenzie, 861.
Swarbrick, Swarbrick, Swarbrick, and Swarbrick, 867.
Johnson (*Luders*), 874.
Newton (*Sellers*), 875.
Brooman (*Semain*), 876.
Johnson (*Brayton*), 887.
Porter, 910.
Newton (*Riedel*), 941.
Howard, Stafford, and McCallum, 943.
Sturgeon, 960.
White, 966.
O'Neill, 970.
Barclay, 1282 (*Supplement*).
Atwater, 1021.
Newton (*Danford*), 1024.
Gresham, 1057.
Marshall, 1062.
Davies (*Quinn*), 1088.
Turton, 1091.
Fairbank, 1104.

Feed water, &c.—*cont.*

Trotman, 1123.
Ramsbottom, 1126.
Bousfield (*McKenzie*), 1128.
Abel (*Hervier and Guizot*), 1129.
Robinson (*Sellers*), 1131.
Haseltine (*Wiard*), 1168.
Varley, 1174.
Robinson, 1192.

Feeding air to steam boiler furnaces, and flues, to promote combustion of the fuel, gases, or smoke. *See also* Blowing and exhausting boiler furnaces; *also* Blast pipes:

Gössell (*Stössger*), 4.
Yarrow and Neilson, 27.
Belpaire, 31.
Moffat, 33.
Humphrys, 40.
Delabarre, 42.
Clark, 53.
Robertson and Ritchie, 73.
Salmon, 84.
Salmon, 92.
Pollit, 93.
Tyrrell, 100.
Robertson and Ritchie, 102.
Wehnert (*Trochon*), 109.
Hydes, 145.
Bagshaw, 149.
Newton (*Brandt*), 150.
Sykes and Sykes, 161.
Mulholland, 175.
Hendry, 190.
Bremner, 201.
Stratford, 201.
Phillips, 206.
Allan, 224.
Armstrong, 230.
Leeming, 232.
Louch, 235.
Parker, Wells, and Wells, 246.
Mennons (*Palazot*), 261.
Brooman (*Friedmann and De Erlanger*), 285.
Rydill, 294.
Howden, 315.
Bonneterre, Erhart, and Monti, 353.
Johnson (*Harrison*), 380.
Joyce, 390.
Sawyer and Padhgam, 391.
Allan, 392.
Mennons (*De Erlanger and Friedmann*), 397.
Dunn, 402.
Le Conte, 417.
Prince ((*Langen*), 424.
Eastwood, 437:
Napier and Rankine, 445.

Feeding air, &c.—*cont.*
Auld and Auld, 447.
Moule, 451.
Tolhausen (*Biddle*), 460.
Bakewell (*Schmidt*), 463.
Wilson, 478.
Law and Downie, 479.
Goucher, 480.
Hadfield, 487.
Williamson, 488.
Hoyos, 498.
Johnson (*Hébert*), 501.
Pôtel, 505.
Lockwood, 512.
Goucher, 515.
Thierry, 527.
Tone (*Furness*), 547.
Box, 549.
Kirkham, 573.
Loftus, 575.
Hendry and Coutts, 580.
Hargreaves, 581.
Robinson, 583.
Jean, 587.
Ivory, 590.
Brooman (*Meyn*), 591.
Rowing, 596.
Cutler, 601.
Stewart, 617.
Wright and Wright, 648.
Dix, 650.
Prince (*Linton*), 680.
Becks, 683.
Rowing, 687.
North, 693.
Richardson, 698.
Newton (*Borsig, Freudenthal, and Daelen*), 698.
Fowler and Webb, 713.
Clark (*Miquet and Boissilier*), 726.
Hide, 727.
Palmer, 731.
Cosserat, 741.
Clark (*Duméry*), 789.
Blampoil, 797.
Cochrane 803.
Brooman (*De Beauregard*), 804.
Robertson, 818.
Galloway, 819.
Hewes, 830.
Hills, 837.
Cass, 840.
Jacob and Pilzinger, 849.
Hopkinson and Hopkinson, 851.
Wilson and Howden, 856.
Rydill, 872.
Brooman (*Sauret and De Fleury*), 882.
Francis, 883.
Molden, Newsome, and Akeroyd, 895.
Cohen (*Cohen*), 896.
Brooman (*De Beauregard*), 908.
Godfrey, 910.
Clark (*Fouché and Moret*), 911.
Zbyszewski (*Szpis*), 924.

Feeding air, &c.—*cont.*
Bousfield (*Hayes*), 925.
Robinson and Varley, 928.
Martin, 930.
Lockwood, 938.
Bennett (*Bassett*), 942.
Worssam, 950,
Watkin, 951.
Beardmore, 964.
Tennant, 974.
Newton (*Fletcher*), 975.
Bennett, 977.
Lancaster, 979.
Wilson, 980.
Brown, 982.
Fairlie, 984.
Warriner, 989.
Fisher, 993.
Prideaux, 997.
Blackburn, 998.
Hiscocks, 998
Newton (*Bond and Ritchie*), 999.
Wilson, 1001.
Woodward and Woodward, 1017.
Molden, 1018.
Gall, 1025.
Bischoff (*Creuzbaur*), 1035.
Richardson, 1044.
Chesters, 1054.
Cochrane, 1284 (*Supplement*).
Botterill, 1069.
Hampton, 1080.
Leigh, 1095.
Abbott, 1099.
Salmon, 1113.
Newton, 1124.
Newton (*Fisher*), 1133.
Dixon, 1154.
Fisher, 1160.
Robertson, 1162.
Wilson, 1164.
Watts, 1171.
Calvert, 1176.
Bagshawe, 1178.
Lyttle, 1185.
Dawson, 1186.
Glenton, 1189.
Ramsbottom, 1196.
Bridges and Bigwood, 1199.
Hauworth, 1206.

Feeding fuel to boiler furnaces. *See also* Combustion of Fuel; Fuel for heating steam boilers other than ordinary coal; *also* Heating steam boilers:
Johnson (*Corbin-Desboissières*), 1.
Guffroy, 12.
Humphrys, 40.
Sawyer, 43.
Mennons (*Keifler*), 94.
Robertson and Ritchie 102.
Yates, 130.

Feeding fuel, &c.—*cont.*

- Birkbeck (*Chéry*), 163.
- Phillips, 206.
- Jobson, 212.
- Sykes, Sykes, and Crossley, 226.
- Leach, 233.
- Mennons (*Palazot*), 261.
- Hesketh and Parsell, 263.
- Joyce, 390.
- Sawyer and Padgham, 391.
- Prince (*Langen*), 424.
- Shillito and Moor, 532.
- Hendry and Coutts, 580.
- Jean, 587.
- Ivory, 590.
- Martin, 613.
- Newton (*Borsig, Freudenthal, and Daelen*), 698.
- Palmer, 731.
- Messer, 732.
- Cosserat, 741.
- Zeh, 774.
- Clark (*Duméry*), 789.
- Brooman (*De Beauregard*), 804.
- Roger, 813.
- Best and Holden, 826.
- Wilson, 843.
- Wilson and Howden, 856.
- Lamport, 889.
- Brooman (*Durand*), 905.
- Brooman (*De Beauregard*), 908.
- Zbyszewski (*Szpis*), 924.
- Juckes and Swinburne, 924.
- Bousfield (*Hayes*), 925.
- Westley (*Pinkus*), 936.
- Green and Green, 945.
- Fairlie, 984.
- Clark (*Piret and Michel*), 1080.
- Prince (*Bührer and Hamel*), 1097.
- Salmon, 1113.
- Wilson, 1164.
- Watts, 1171.
- Humphrey, 1177.
- Dickens, Heywood, and Holland, 1194.
- Ripley and Barker, 1204.

Feeding worked steam to boilers:

- Nash, 39.

Filtering feed water, and apparatus for:

- Clark (*Sébillot*), 477.
- Slack, 658.
- Allen, 662.
- Vignier, 909.
- Newton (*Eames*), 913.

Fire bars for furnaces, including hollow and moving bars:

- Langen, 15.
- Belpaire, 31.

Fire bars, &c.—*cont.*

- Humphrys, 40.
- Blackwood, 1219 (*Supplement*).
- Robertson and Ritchie, 73.
- Apsey and Buckwell, 79.
- Salmon, 84.
- Mennons (*Keifler*), 94.
- Martin and Purdie, 125.
- Yates, 130.
- Pearce, 142.
- Birkbeck (*Chéry*), 163.
- Wilson, 181.
- Farren, 194.
- Spencer and Taylor, 199.
- Cass, 202.
- Jobson, 212.
- Armstrong, 230.
- Louch, 235.
- Parker, Wells, and Wells, 246.
- Johnson (*Baudet*), 262.
- Hesketh and Parsell, 263.
- Brooman (*Friedmann and De Erlanger*), 285.
- Brooman (*Friedmann and D'Erlanger*), 313.
- Monckton, 318.
- Gilbee (*De Vos Verraert*), 344.
- Parkinson, Norman, and Cottam, 379.
- Sawyer and Padgham, 391.
- Dunn, 402.
- Smith and Rayment, 411.
- Le Conte, 417.
- Prince (*Langen*), 424.
- Eastwood, 437.
- Smith, 462.
- Morley, 471.
- Murrell, 490.
- Bousfield (*Dickerson*), 504.
- Smith, 513.
- Colquhoun and Ferris, 514.
- Box, 549.
- Davison, 564.
- Jones, 574.
- Whitworth and Wrigley, 579.
- Jean, 587.
- Colquhoun and Ferris, 595.
- Box, 627.
- Dix, 650.
- Martin and Wylan, 675.
- Clark (*Miguet and Boissilier*), 726.
- Cosserat, 741.
- Zeh, 774.
- Robertson, 818.
- Cass, 840.
- Hulley, 846.
- Jacob and Pilzinger, 849.
- Newton (*Thayer and Pond*), 859.
- Buchanan, 890.
- Molden, Newsome, and Akeroyd, 895.
- Cohen (*Cohen*), 896.
- Godfrey, 910.
- Schofield, 913.

Fire bars, &c.—*cont.*
- Juckes and Swinburne, 924.
- Lockwood, 938.
- Salisbury, 957.
- White, 966.
- Tennant, 974.
- Newton (*Davis and Anable*), 983.
- Warringer, 989.
- Holden, 1018.
- Gedge (*Mondini*), 1028.
- Dow, 1033.
- Newton (*Fletcher and Hughes*), 1061.
- Wimpenny, 1077.
- Hampton, 1080.
- Fraser, 1092.
- Lees, 1095.
- Abbott, 1099.
- Dixon, 1154.
- Bérard, 1155.
- Robertson, 1162.
- Newton (*Bailey*), 1175.
- Humphrey, 1177.
- Ramsbottom, 1196.
- Ripley and Barker, 1204.

Fire-brick lumps, bars, and clay, employed in or about furnaces and flues :
- Salmon, 92.
- Young, 188.
- Farren, 194.
- Spencer and Taylor, 199.
- Burch, 221.
- Leach, 233.
- Louch, 235.
- Rydill, 245.
- Romaine, 319.
- Dix, 650.
- Rickett, 666.
- Martin, 930.
- Wilson, 988.
- Hauworth, 1206.

Fire-engines (steam). *See also* Steam engines combined with machines :
- Shand and Mason, 1227 (*Supplement*).
- Shand and Mason, 391.
- Roberts, 418.
- Merryweather, Merryweather, and Field, 438.
- Lee and Winter (*Larned*), 540.
- Barron, 546.
- Shand, 549.
- Blake (*Button and Blake*), 733.
- Graveley, 765.
- Shaw, 796.
- Hoskold and Brain, 992.
- Arthur and Davis, 1013.
- Aydon and Field, 1112.

Fixing and removing boiler and condenser tubes :
- Barré, 19.
- Normandy, 66.
- Jack and Rollo, 136.
- Horn (*Allen*), 217.
- Burch, 221.
- Harlow, 1231 (*Supplement*).
- Louch, 235.
- Russell, 261.
- Barré, 263.
- Furlonge, 281.
- Henry (*Gifford*), 282.
- Williamson, 285.
- Pendred, 292.
- Parker, Wells, and Wells, 317.
- Hirst and Taylor, 386.
- Redstone (*Redstone*), 395.
- Weallens, 427.
- Johnson (*Bérendorf*), 454.
- Mace, 474.
- Randolph and Elder, 516.
- Spencer, 552.
- Newton (*Booraem*), 585.
- Newton (*Judson*), 593.
- Newton (*Howell and Birdsall*), 657.
- Rickett, 666.
- Bousfield (*Judson*), 711.
- Newton (*Lighthall*), 714.
- Lloyd and Lloyd (*Knickerbocker*), 753.
- Lloyd and Lloyd (*Blackwood*), 753.
- Hetherington, 851.
- Newton (*Judson*), 881.
- Tweddell, 891.
- Newton (*Stimers*), 911.
- Soutar (*McDowell*), 943.
- Howey, 954.
- Bonneville (*Chaudoir*), 1028.
- Bousfield (*Dudgeon*), 1042.
- Howard and Bousfield, 1115.
- Daglish, 1143.

Flanging boiler and other plates :
- Adamson and Leigh, 394.
- Wilkinson, 469.
- Taylor, 571.

Flexible steam-tubes and pipes :
- Pragst, 577.
- Reade (*Lansdell*), 1118.

Floats :
- Fletcher, 98.
- Tassin, 481.
- Trustwell and Trustwell, 811.

Flues and tubes of steam boilers. *See also* Tubes and pipes ; and Tubes, &c. :
- Hill, 17.
- Smythies, 1217 (*Supplement*).

Flues and tubes, &c.—*cont.*
Hopkinson and Ridings, 47.
Salmon, 92.
Wardle, 111.
Petrie, 119.
Burch, 137.
Roberts, 145.
Williams, 149.
Davies (*Montgomery*), 158.
Hendry, 190.
Spencer and Taylor, 199.
Rigby and Lowe, 229.
Harlow, 1231 (*Supplement*).
Smyth, 233.
Grimaldi, 237.
Hughes, 249.
Galloway, Galloway, and Wilson, 252.
Russell, 261.
Anthony, 262.
Stothert, 270.
Holt, 276.
Fanshawe and Jaques, 288.
Grimaldi, 306.
Monckton, 318.
Hirst and Taylor, 386.
Macnab, 410.
Williams, 418.
Napier and Rankine, 445.
Varley and Crowther, 457.
Hadfield, 487.
Musgrave, 502.
Smethurst, 1266 (*Supplement*).
Smethurst, 503.
Bousfield (*Dickerson*), 504.
Hill and Hill, 509.
Barber, 518.
Heather and Redfern, 534.
Rigby, 541.
Winans and Winans, 1267 (*Supplement*).
Jewell, 569.
Ivory, 590.
Monckton, 598.
Stewart, 617.
Hall, 634.
Martin, 694.
Davies (*Holagray*), 750.
Cochrane, 751.
Lloyd and Lloyd (*Knickerbocker*), 753.
Lloyd and Lloyd (*Blackwood*), 753.
Munro, 766.
Reid (*Clark*), 767.
Newton (*Stimers*), 1280 (*Supplement*).
Ivory, 781.
Stott, 792.
Newton (*Lavery and Stuart*), 808.
Lewis, 825.
Cass, 840.
Alleyne, 845.
Howard, 850.
Humphrys, 854.
Mathews and Fereday, 865.

Flues and tubes, &c.—*cont.*
Swarbrick, Swarbrick, Swarbrick, and Swarbrick, 867.
Rydill, 872.
Young, 897.
Brooman (*Durand*), 965.
Sicardo, 964.
Ghiselin (*Clark*). 964.
Mathews, Southwick, and Fereday, 967.
Barclay, 996.
Blackburn, 998.
Bonneville (*Chaudoir*), 1025.
Gedge (*Mondini*), 1025.
Stocks, 1036.
Bousfield (*Dudgeon*), 1042.
Pearce, 1066.
Davies (*Schaubel*), 1067.
Holt, 1078.
Burrows and Burrows, 1090.
Field and Wise, 1103.
Plant, 1122.
Newton (*Feyh and Emery*), 1166.
Newton (*Bailey*), 1175.
Clark (*Chevalier*), 1191.
Thompson (*Thomas and Somerville*), 1193.
Lewis, 1209.

Fluid meters. *See also* Gauges and meters :
Gutknecht, 314.
Clenet, 412.
Ramsbottom and Blackburn, 567.
Clark (*De Keravenan*), 922.
Clark (*Washburn*), 944.

Flying machines, steam engines for propelling :
Smythies, 1217 (*Supplement*).
Gedge (*Carmien*), 1254 (*Supplement B*).
Gedge (*Carmien*), 1254 (*Supplement B*).
Boyman, 1262.

Foot valves. *See also* Valves :
West, 401.
Calvert, 773.

Formulæ :
Boyman, 97.
Henry (*Foucault*), 444.
Boyman, 1262.

Forcing air into steam boilers. *See* Air forced into, &c.

Framing of steam engines and steam hammers :
Spencer, 9.
Bell and Cutts, 48.

Framing of steam engines, &c.—*cont.*
Johnson, 66.
Muntz and King, 70.
Mennons (*Gáche*), 101.
Hirst, 115.
Calvert, 118.
Henderson, 142.
Crosland, 147.
Chellingworth and Thurlow, 167.
McNaught, 238.
Chellingworth and Thurlow, 242.
Woodward, Woodward, and Woodward, 297.
Johnson, 340.
Knowelden, 366.
Death, 389.
Butler, 1257 (*Supplement*).
Maco, 474.
Wymer, 475.
Jackson and Watkins, 490.
Lee and Winter (*Larned*), 540.
Shand, 549.
Paterson, 632.
Fletcher, 655.
Crosland, 754.
Keene (*Richards*), 920.
Clark, 1107.
Appleby, 1107.
Fowler (*Quadling*), 1110.
Dudgeon, 1163.
Dœring, 1179.
Ramsbottom, 1196.

Fuel for heating steam boilers other than ordinary coal:
Robertson and Ritchie, 102.
Wehnert (*Trochon*), 109.
Jackson, 155.
Fitz-Maurice, 168.
Jacob (*Preisenhammer and Weniger*), 193.
Wilson, 1228 (*Supplement*).
Adams, 244.
Wilson, 1241 (*Supplement*).
Blackmore and Lamb, 386.
Biddle, 400.
Macintosh, 1259 (*Supplement*).
Linton (*Shaw*), 448.
Moule, 451.
Hinde, 458.
Tolhausen (*Biddle*), 460.
Bakewell (*Schmidt*), 463.
Macintosh, 479.
Morel, 553.
Martin, 579.
Cutler, 601.
Adams, 1272 (*Supplement*).
Clayton, 670.
Leslie, 675.
Prince (*Linton*), 680.
Becks, 683.
Boulton, 695.
Richardson, 698.

Fuel for heating steam boilers, &c.—*cont.*
Boulton, 709.
Shaw (*Dewies*), 710.
Fowler and Webb, 713.
Stevens (*Stevens*), 726.
Wheatley, 796.
Brooman (*De Beauregard*), 804.
Kirby, 816.
Jacob and Pilzinger, 849.
Sim, 850.
Barff and Sim, 903.
Lyttle, 918.
Zbyszewski (*Szpis*), 924.
Bousfield (*Hayes*), 925.
Sherwood, 926.
Westley (*Pinkus*), 936.
Salisbury, 957.
Wise, Field, and Aydon, 962.
Warringer, 989.
Clark, 1008.
Kidd, 1027.
Parker, 1029.
Richardson, 1044.
Davies (*Haskins*), 1068.
Lees, 1095.
Leigh, 1095.
Price (*Bührer and Hamel*), 1097.
Stevens (*Stevens*), 1097.
Bousfield (*Elsberg*), 1130.
Lyttle, 1185.

Furnace doors:
Yarrow and Neilson, 27.
Sawyer and Padgham, 391.
Cochrane, 751.
Lake, 839.
Caddick, 1285 (*Supplement*).
Bridges and Bigwood, 1199.

Furnace fires. *See* Stirring, clearing, regulating, &c.

Furnaces and fire-boxes:
Johnson (*Corbin - Desboissières*), 1.
Gössell (*Stössger*), 4.
Belpaire, 31.
Sawyer, 43.
Sykes, Sykes, and Crossley, 49.
Parkes, 183.
Allan, 224.
Rydill, 245.
Brooman (*Friedmann and De Erlanger*), 285.
McConnell, 337.
Mennons (*De Erlanger and Friedmann*), 397.
Moule, 451.
Wilkinson, 469
Smith, 513.
Ellis, 537.
Box, 549.
Messer, 732.

Furnaces and fire-boxes—*cont.*

- Millar, 810.
- Hills, 837.
- Wilson, 843.
- Brooman (*Meunier*), 854.
- Wilson and Howden, 856.
- Wilson, 917.
- Juckes and Swinburne, 924.
- White, 966.
- Fairlie, 984.
- Pearce, 1066.
- Fowler (*Quadling*), 1110.
- Clark (*Chevalier*), 1191.
- Hauworth, 1206.

Furnaces for heating steam boilers and otherwise employed :

- Cowan, 1244 (*Supplement*).
- Blackmore and Lamb, 386.
- Joyce, 390.
- Bliss (*Wilkinson*), 401.
- Clayton, 1262 (*Supplement*).
- Bessemer, 1263 (*Supplement*).
- Kirkham, 573.
- Duckett, 1274 (*Supplement*).
- Clayton, 670.
- Clayton, 739.
- Scott and Tudor, 1279 (*Supplement*).
- Hawksley, Wild, and Astbury, 1116.
- Caddick, 1285 (*Supplement*).

Furnaces of steam boilers and generators. *See also* Smoke-consuming boiler furnaces; *also* Furnaces and fire-boxes :

- Langen, 15.
- Redfern, 34.
- Sawyer, 43.
- Blackwood, 1219 (*Supplement*).
- Clark, 53.
- Robertson, 63.
- Apsey and Buckwell, 79.
- Miller, 80.
- Romaine, 82.
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- Mennons (*Keifler*), 94.
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- Johnson (*Lister*), 991.
- Bates, Brookes, and Brookes, 995.
- Beck, 997.
- Clark (*Bobrownicki*), 1283 (*Supplement*).
- Huch and Windhausen, 1061.
- Blatch, 1098.
- Oldham, 1149.
- Tongue (*James and Condict*), 1166.
- Hunter, 1173.

Pneumatic governor. *See also* Governors:
- Jones, 662.

Portable way for traction and similar engines:
- Simonton, 239.

Portable steam engines. *See also* Agricultural steam engines; Locomotive steam engines; Locomotive steam carriages; and Traction steam engines:
- Povah, 97.
- Syrett, 140.
- Kirby, 234.
- Colburn, 600.
- Allen, 662.
- Crowe, 724.
- Davies (*Nillus*), 1038.

Ports, ways, and passages, in cylinders and other parts of engines:
- Calvert, 118.
- Newton (*Cox and Cox*), 122.
- Edge, 131.
- Joy, 143.
- Knight (*Lee*), 1238 (*Supplement*).
- Calvert, 277.
- Scott, 316.
- Newton (*Lee*), 326.
- Thompson, 364.
- Knowelden, 366.
- Scheutz, 388.
- Dutton, 405.
- Unsworth, 436.
- Wymer, 475.
- Bousfield (*Stevens*), 529.
- Coulthard, 536.
- Calvert, 542.
- Adams, 544.
- Neill, 551.
- Schiele, 561.
- Whittaker, 568.

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Rowing, 596.
Clark (*Lemaire*), 635.
Coates, 639.
Snowdon, 657.
Howe, 676.
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Rowing, 687.
Haseltine (*Woodbury*), 699.
Miller, 700.
Nalder and Belcher, 811.
Spencer, 821.
Lester, 831.
Davies (*Lacoste*), 834.
Rooke, 864.
Clark (*Whiting and Rowland*) 991.
Farey, 1022.
Hawdon, Hawdon, and Heather, 1056.
Yule, 1090.
Naylor, 1117.
Kochs, 1128.
Porter (*Allen*), 1141.
Deacon, 1161.
Dixon, 1187.

Pressure gauges. *See* Steam and pressure gauges :

Priming in boilers, prevention of :

Clark, 53.
Wilson, 172.
Armstrong, 230.
Simonton, 239.
Townsend, 985.
Seward, 1094.

Propelling engines and carriages by unusual means :

Paterson, 75.
Lillie, 756.
Henry (*Bernier and Desmarest*), 834.

Propelling vessels by steam for various purposes and by different modes :

Budden (*Pilkington*), 124.
Roberts and Symonds, 135.
Henderson, 142.
Harratt, 144.
Wilson, 172.
Weallens. 188.
Turner, 250.
Sievier, 1287 (*Supplement B.*).
Spencer, 334.
Parker, 1248 (*Supplement*).
Leigh, 1253 (*Supplement*).
Onion, 408.
Duntze (*Ashe*), 442.

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Budden (*Pilkington*), 454.
Johnson (*Gardère and Patek*), 1267 (*Supplement*).
Stanley and Stanley, 1269 (*Supplement*).
Symes, 1276 (*Supplement*).
Ravard (*Brunier*), 743.
Andreux and Coulon, 751.
Lillie, 756.
Galloway, 787.
Galloway, 819.
Fraser, 1282 (*Supplement*).
Parker, 1099.
Fraser, 1117.
De Ruset and Dale, 1284 (*Supplement*).
Dudgeon, 1163.
Kirk, 1170.
Boulton, 1175.
Brooman (*Chauveau and de Carfort*), 1182.
Simpson, 1189.
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Gray, 1206.

Protecting boiler tubes. *See also* Coating, &c. :

Wall, 196.
Rowan and Horton, 260.
McConnell, 337.
Williamson, 347.
Hart and Lavender, 356.
Parkes, 370.
Adamson, 1006.

Pump valves. *See also* Valves.

Muntz and King, 70.
Joy, 143.
Davison and Paterson, 199.
Knight (*Lee*), 1238 (*Supplement*).
Newton (*Stevens*), 270.
Knowelden, 297.
Newton (*Lee*), 326.
Peel and Simpson, 1256 (*Supplement*).
Husband, 416.
Roberts, 418.
Hawthorn and Hawthorn, 446.
West, 498.
Barron, 546.
Wilson, 705.
Bonneville (*Deprez*), 744.
Crosland, 754.
Ivory, 781.
Nalder and Belcher, 811.
Routledge and Ommanney, 952.
Hoskold and Brain, 992.
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Ingram and Phillips, 1093.
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Pumping steam engines. *See also* Rotary pumps; *also* Steam pumps :

Barclay, 35.
Newton (*Knowles*), 57.
Johnson, 66.
Barclay, 111.
Moy, 153.
Barclay, 186.
Knight (*Lee*), 1238 (*Supplement*).
Newton (*Lee*), 326.
Colburn, 1259 (*Supplement*).
Husband, 416.
Roberts, 418.
Sickles, 437.
Braddock, 452.
Paul, 470.
Whitehead, 533.
Barron, 546.
Neill, 551.
Stanley and Stanley, 1269 (*Supplement*).
Colburn, 600.
Holman, 606.
De Stains, 627.
Miller, 700.
Yule, 705.
Wilson, 705.
Blake (*Button and Blake*), 733.
Crosland, 754.
Graveley, 765.
Oram, 849.
Goodfellow, 860.
Benson, 916.
Shekelton and Gibson, 1008.
Clark (*Cameron*), 1050.
Brown, 1092.
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Phillips-Smith, 1129.
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Amos, 370.
Clark (*Louvie*), 1264 (*Supplement*).
Whitehead, 533.
Clark (*Root*), 550.
Holman, 606.
Newton (*Lansdell, Alter, and Francis*), 649.
Laidlaw and Robertson, 780.
Porter, 910.
Arthur and Davis, 1013.
Robertson, 1015.

Pumps and working gear for engines :

Macnab, 89.
Spencer, 171.
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Newton (*Stevens*), 270.
Knowelden, 297.
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Spencer, 481.
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Snell (*Yapp*), 599.
Elder, 618.
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Pyrometers :

Robertson and Ritchie, 102.
Bailey and Bailey, 298.
Brooman (*De Beauregard*), 304.
Clark (*Merlanchon*), 545.
Scott and Tudor, 1279 (*Supplement*).
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Radiation of heat, prevention of :

Clark (*Joly*), 144.
Parker, Wells, and Wells, 317.
Spence, 431.
Thorp, 453.
Hargraves, 614.
James, 622.
Barwell, 665.
Estourneaux and Beauchamps, 1280 (*Supplement*).
Bevan and Fleming, 815.
Le Roy, 865.
Boffey and Smith, 955.
Thys, 971.
Simons and Brown, 979.
Jones, 1075.
White, 1076.
Caddick, 1285 (*Supplement*).

Railway construction, chiefly relating to ascending inclines, safety apparatus, &c. *See also* Inclines, ascending :

Arrowsmith, 195.
Bramwell and Owen, 217.
Mennons (*Velini*), 383.
Manzini, 407.
Fell, 473.
Dunn, 557.
Fell, 628.
Crockford, 801.
Salmon, 802.
Millar, 810.
Fell, 1138.

Raising and forcing water and liquids. *See also* Steam jets, &c.; Pumping engines, Pumps, Rotary pumps, and Steam pumps :

Delabarre, 42.
Jack and Rollo, 136.
Bousfield (*Chase*), 257.
De Clercq and Chazelles, 288.
Olding, 302.
Newton (*Lee*), 326.
Cleuet, 413.
Newton (*Brear*), 1250 (*Supplement*).
Gedge (*Escapat*), 1258 (*Supplement*).
Colburn, 1259 (*Supplement*).
Thomson, 486.
Clark (*Louvie*), 1264 (*Supplement*).
Thomson, 531.
Humphrys, 543.
Wagstaff, 548.
Neill, 551.
Holmon, 606.
Barclay and Morton, 610.
De Stains, 627.
Wilson and Lindsley, 632.
Newton (*Lansdell, Alter, and Francis*), 649.
Barclay, 701.
Wilson, 705.
Boulton, 706.
Fletcher and Bower, 719.
Blake (*Button and Blake*), 733.
Bonneville (*Deprez*), 744.
Pilliner and Hill, 750.
Laidlaw and Robertson, 780.
Robinson and Gresham, 788.
Gresham, 842.
Boulton, 862.
Brooman (*Samain*), 876.
Boulton, 923.
McEwan and Neilson, 931.
Barclay, 1282 (*Supplement*).
Shekelton and Gibson, 1008.
Arthur and Davis, 1013.
Robertson, 1015.
Atwater, 1021.
Gresham, 1057.
Parker, 1099.
Newton (*Lansdell*), 1105.
Aydon and Field, 1112.
Reade (*Lansdell*), 1118.
Robinson (*Sellers*), 1131.
De Rusett and Dale, 1284 (*Supplement*).

Rams on shipboard worked by steam :

Griffiths, 1288 (*Supplement B.*).
Beardmore, 1250 (*Supplement*).
Jones, 1288 (*Supplement B.*).

Rams, &c.—*cont.*

Sievier, 1289 (*Supplement B.*).
Burchall and Borrows, 1291 (*Supplement B.*).

Reaction of momentum, availed of as auxiliary power :

Scott, 1236 (*Supplement*).
Gill, 645.
Gill, 738.
De Bergue (*De Bergue*), 818.

Reaction emission steam engines :

Receivers for compound engines, working high and low pressure steam :

Walls, 3.
Cowper, 428.
Henderson (*McLardy*), 447.
Elder, 1114.

Reciprocating stationary steam engines, the pistons or cylinders having to and fro rectilinear motion; including *also* Compound high and low pressure steam engines; Marine steam engines; Trunk steam engines; Pumping steam engines; Beam steam engines, and Oscillating steam engines, which are severally classified under separate headings. *See also* Steam engines :

Walls, 3.
Spencer, 9.
Bevis, 12.
Johnson (*Fossey*), 1216 (*Supplement*).
Hartley, 16.
Rowan and Horton, 24.
Wain, 25.
Morrison, 30.
Barclay, 35.
Beardmore and Rigby, 41.
Bell and Cutts, 43.
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Davies (*Verrier*), 44.
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Gourlay and Kemp, 52.
Newton (*Knowles*), 57.
Fisher and Fisher, 59.
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Johnson, 66.
Muntz and King, 70.
Newton (*Crosby, Savage, and Stearns*), 71.
Fletcher, 76.
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Clark (*Minié*), 94.
Povah, 97.
Mennons (*Gâche*), 101.
Barclay, 111.
Hirst, 115.
Calvert, 118.
Barnett, 120.
McNaught, 128.
Rousseau, 133.
Roberts, 135.
Roberts and Symons, 135.
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Syrett, 140.
Henderson, 142.
Crosland, 147.
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Weallens, 188.
Humphrys, 198.
Davison and Paterson, 199.
Cass, 202.
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Shand and Mason, 1227 (*Supplement*).
Roberts, 208.
Huddart and Huddart, 213.
Scott, 214.
Mash, 216.
Humphrys, 219.
Hancock and Hancock, 229.
Rollo, 232.
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Spencer, 240.
Harnett, 246.
Parker, Wells, and Wells, 246.
Shaw, 1234 (*Supplement*).
Kinsey, 253.
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Musgrave, 265.
Knight (*Lee*), 1238 (*Supplement*).
Dickinson, 269.
Macnab, 273.
Merritt, 276.
Holt, 276.
Calvert, 277.
Henry (*Gifford*), 282.
Woodward, Woodward, and Woodward, 297.
man (*Archibald*), 300.
y, 308.
den, 315.

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Clark (*Arnier*), 316.
Scott, 316.
Rippingille, 328.
Joy, 1245 (*Supplement*).
Macnab, 332.
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Peters, 335.
Allen and Stewart, 336.
Johnson, 340.
Parker and Batman, 349.
Humphrys, 351.
Humphrys, 357.
Parker (*Schäffer*), 359.
Kay and Hartley, 362.
Thompson, 364.
Knowelden, 366.
Park, 368.
Spencer, 368.
Allen, 372.
Elder, 373.
Shaw (*Shaw*), 375.
Childs (*Ray, Redstone, and Redstone*), 377.
Brakel, Hoehl, and Gunther, 384.
Death, 389.
Hook, 390.
Dutton, 405.
Colburn, 1259 (*Supplement*).
Humphrys, 409.
Glanville, 417.
Selby, 419.
Cowper, 428.
Field, 432.
Unsworth, 436.
Duntze (*Ashe*), 442.
Wilson, 443.
Napier and Rankine, 445.
Henderson (*McLardy*), 447.
Caird, 449.
Delany and Okes, 450.
Varley and Crowther, 457.
Petrie, 459.
Bessemer, 1263 (*Supplement*).
Paul, 470.
Milner, 471.
Mellor and Whaley, 472.
Mace, 474.
Wymer, 475.
Spencer, 481.
Spencer, 482.
Walker, 484.
Penn, 488.
Jackson and Watkins, 490.
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Swinburne and Stanley, 507.
Atkinson, 526.
Day, Lamb, and Summers, 527.
Livsey (*Leigh*), 529.
Bousfield (*Stevens*), 529.
Coulthard, 536.
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Clark (*Root*), 550.
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Hutchinson, 583.
Newton (*Waterman*), 584.
Stanley and Stanley, 1269 (*Supplement*).
Ivory, 590.
Rowing, 596.
Colburn, 600.
Holman, 606.
Elder, 618.
Brooman (*Barbier*), 625.
Howden, 630.
Clark (*Lemaire*), 635.
Brookes (*Guyet*), 638.
English, 643.
Runkel, 654.
Lupton, Whittaker, Whittaker, and Hartley, 655.
Joyce, 661.
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Howe, 676.
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Crosland, 754.
Löbnitz, 755.
Cuthell, 764.
Gibson, 768.
Calvert, 773.
Ivory, 781.
Boulton, 783.
Brisbane, 793.
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Gedge (*Montmeja*), 801.
Davey, 803.
King, Smith, and Howell, 805.
Nalder and Belcher, 811.
Spencer, 821.
Jones, 824.
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Best and Holden, 826.
Hicks, 828.
Durhan, 829.
Lester, 831.
Davies (*Lacoste*), 834.
Lungley, 838.
Batho, 843.
Swann, 846.
Lawrence (*Ewbank*), 859.
Rooke, 864.
Vaughan, 869.
Wyllie and Gray, 883.
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Johnson (*Brayton*), 887.

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Newton (*Danford*), 889.
Pokutynski and Mycielski, 892.
Newton (*Isham*), 927.
Cartwright, 934.
Clark (*Washburn*), 944.
Frazer, 1282 (*Supplement*).
Howard (*Jackson*), 959.
Hunt, 968.
Stocker, 986.
Clark (*Whiting and Rowland*), 991.
Wheeler, 994.
Beck, 997.
Winter, 999.
Clark (*Bobrownicki*), 1284 (*Supplement*).
Orr, 1014.
Farey, 1022.
Adams and Parson, 1023.
Smith, 1030.
Kerr (*Hughes and Phillips*), 1031.
Yule, 1090.
Kittoe, 1096.
Elder, 1114.
Clark (*Phillips and Hewes*), 1115.
Naylor, 1117.
Ramsbottom, 1126.
Kochs, 1128.
Varley, 1137.
Newton (*Root*), 1156.
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White (*Ansaldi*), 1180.
Erskine, 1185.
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Ramsbottom, 1196.

Rectilineal motion, obtaining:
Newton (*Buchanan and Righter*), 582.
Shekelton and Gibson, 1008.

Refrigerating and cooling liquids and vapours. *See also* Refrigerators; Condensing steam; and Condensers:
Eunson (*Eunson*), 7.
Williams, 149.
Mennons (*Lehot*), 182.
Clark (*Lighthall and Chrystie*), 248.
Newton (*Stevens*), 274.
Howden, 315.
Tizard, 376.
Boetius, 387.
Jeffreys, 434.
Jeffreys, 521.

Refrigerating, &c.—*cont.*
- Cochrane, 605.
- Lane, 641.
- McVitie, 697.
- Newton (*Lighthall*), 714.
- Laidlaw and Robertson, 780.
- Boulton, 798.
- Newton (*Somes*), 857.
- Johnson (*Luders*), 874.
- De St. Céran, 877.
- Wood, 888.
- Ashby, 912.
- Smith and Batho, 956.
- Wheeler, 1002.
- Haseltine (*Wiard*), 1168.
- Coffey, 1198.

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- Rowan and Horton, 24.
- Howden, 150.
- Johnson (*Prouvost*), 176.
- Clark (*Lighthall and Chrystie*), 248.
- Lane, 641.
- Martin, 642.
- Wood, 888.

Regenerating, worked, or other steam. *See also* **Regenerative engines:**
- Rowan and Horton, 24.
- Davies (*Verrier*), 44.
- Datichy, 63.
- Wenham, 79.
- Rousseau, 133.
- Prince (*De Bayelt*), 160.
- Johnson (*Prouvost*), 176.
- Brooman (*Barbier*), 625.
- Gerstenberger, 663.
- Huch Windhausen, 769.
- Elder, 1114.

Regenerative engines:
- Siemens, 114.
- Johnson (*Prouvost*), 176.

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- Clarke, 85.
- Porter (*Richards*), 381.
- Weems and Weems, 763.
- Norton and Landless, 980.
- White (*Monte*), 1053.
- Varley, 1174.

Regulating the flow of steam and fluids:
- Prentiss (*Williams*), 169.
- Shaw, 1234 (*Supplement*).
- ne, 266.
- ley and Bailey, 298.
- man (*De Beauregard*), 303.
- knecht, 314.

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- Wood, 344.
- Brooman (*Garnier*), 354.
- Weems and Weems, 355.
- Farron, 366.
- Parkinson and Marsland, 399.
- Colburn, 405.
- Smith and Rayment, 411.
- Roberts, 418.
- Wilson, 443.
- Page, 1265 (*Supplement*).
- Blake, 559.
- Bailey, Blake, and Bailey, 588.
- Smith, 609.
- Henry (*Meynard*), 623.
- Kidd, 636.
- O'Neill, 718.
- Weems and Weems, 763.
- Valance (*Ternois*), 794.
- Foubert, 933.
- Walsh, 1002.
- Lewis, 1020.
- Fletcher, 1026.
- Huch and Windhausen, 1061.
- Lewis, 1068.
- Ghesney, 1111.
- Aydon and Field, 1112.
- Bousfield (*McKenzie*), 1126.
- Robertson, 1190.
- Clark (*Peet*), 1210.
- Cutler and Brown, 1212.

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- Spink, 250.
- Standfield, 293.
- Meriton, 404.
- Barclay, 421.
- Scott (*Winder*), 575.
- Schiele, 599.
- Siemens, 886.
- Comfield, 1003.
- Pope, 1077.

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- Russell and Brown, 134.
- Holt, 276.
- Bonneterre, Erhart, and Mon 353.
- Parkinson and Marsland, 399.
- Dutton, 405.
- Ensor and Payne, 426.
- Henry (*Meynard*), 623.
- Jones, 824.
- Cass, 840.
- Seward, 1094.
- Bousfield (*McKenzie*), 1126.
- Haseltine (*Wiard*), 1168.
- Belleville, 1183.
- Robertson, 1190.
- Walker and Walker, 1209.

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Walls, 3.
Bevis, 12.
Jack and Rollo, 136.
Béziat, 149.
Boulton, 862.
Ingram and Phillips, 1093.

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Hewes, 830.

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Morrison, 30.
Hope, 55.
Siemens, 114.
Travis, 116.
Edge, 131.
Johnson (*Scheutz*), 141.
Rollo, 232.
Davies and Evans, 268.
Yarrow and Hilditch, 288.
Barclay, 349.
Elder, 373.
Childs (*Ray, Redstone, and Redstone*), 377.
Hook, 390.
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Clark (*Root*), 550.
Stanley and Stanley, 1269 (*Supplement*).
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Macklin, 624.
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Gedge (*Montméja*), 801.
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Ramsbottom, 858.
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Wyllie and Gray, 883.
Stevenson (*Venzano*), 938.
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Clark (*Whiting and Rowland*), 991.
Baldwin, 1041.
Bond, 1055.
Atkinson, 1073.
Fowler (*Quadling*), 1110.
Clark (*Merriam and Cushing*), 1130.
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Rivets and rivetting by steam machinery. *See also* **Steam engines combined with machines:**

Adamson and Leigh, 394.
Gray, 524.
Ellis, 537.
Shanks, 1275 (*Supplement*).
Russell, 1279 (*Supplement*).
Adamson, 891.
Emmet, 969.
Cherry, Crossley, and Bower, 1005.
Smith, 1123.
Baldwin, 1147.
Paget, 1148.

Rolling drum steam engines for locomotive traction:

Steveus (*Stevens*), 225.
Blackburn, 548.

Rolling, forging, shaping, cutting, puddling, and working metals by steam. *See also* **Steam engines combined with machines;** *also* **Steam hammers:**

Scott, 1223 (*Supplement*).
Fairbairn (*Haswell*), 1223 (*Supplement*).
Alleyne, 1226 (*Supplement*).
Bramwell and Owen, 217.
Alleyne, 1252 (*Supplement*).
Bessemer, 464.
Bessemer, 1263 (*Supplement*).
Ramsbottom, 512.
Thompson, 520.
Gray, 524.
Dunn, 557.
Taylor, 571.
Longridge, 673.
Bechem and Wedekind, 786.
Shipton and Mitchell, 828.
Ramsbottom, 839.
Alleyne, 845.
Ramsbottom, 858.
Wright, 866.
Massey and Massey, 907.
Ramsbottom, 929.
Winby and Winby, 1031.
Gibson and Ellis, 1088.
Mitchell, 1125.
Bérard, 1155.
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Rotary steam engines. *See also* **Disc steam engines; Reaction emission engines;** *also* **Steam power wheels:**

Ingham and Hinchcliff, 17.
Uren, 22.
Jefferson and Jefferson, 55.

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Edwards, 58.
Blakeley, 74.
Murphy, 74.
Clark (*Minié*), 94.
Giles, 107.
Newton (*Cox and Cox*), 122.
Whicher (*Grande, Olivieri, and Mongiardino*), 128.
Restou, 133.
Johnson (*Scheutz*), 141.
Taylor and Cooper, 164.
Dawson (*Kennish*), 166.
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Hudson (*Grande, Olivieri and Mongiardino*), 223.
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Parker, Wells, and Wells, 317.
Bonell and Spiring, 331.
Spencer, 334.
Nasmyth, 338.
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Booth, Booth, and Booth, 439.
Clark (*Foster and Foster*), 452.
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Robbins, 771.
Becham and Wedekind, 786.
Shipton and Mitchell, 828.
Newton (*Nillus, Nillus, Nillus, and Crouvés*), 830.
Manwell and Manwell, 852.
Johnson (*Haupt*), 871.
Jones, 871.
Appleby, 894.

Steam engines, &c.—*cont.*
Massey and Massey, 907.
Low, 917.
Hulme, 950.
Routledge and Ommanney, 952.
Brown, 982.
Doering (*Sachs*), 986.
Penrice, 1001.
Winby and Winby, 1081.
Walker, 1033.
Gedge (*Musciacco*), 1048.
Brunton, 1110.
Roger, 1119.
Smith, 1123.
Mitchell, 1125.
Bousfield (*Elsberg*), 1130.
Johnson (*Wright*), 1133.
Robinson and Smith, 1134.
Gedge (*Musciacco*), 1153.
Tongue (*James and Condict*), 1166.
Kirk, 1170.
Hunter, 1173.
Doering, 1179.
Routledge and Ommanney, 1182.
Newton (*Habicht*), 1188.
Simpson, 1189.
Haseltine (*Burleigh*), 1192.
Robinson and Smith, 1203.
Gray, 1206.
Simons and Brown, 1213.

Steam engines (miscellaneous) of peculiar construction :
Newton (*Voss*), 179.
Parker and Batman, 349.
Whittaker, 568.
English, 643.
Mountain, 646.
De Kercado, 647.
Symes, 1276 (*Supplement*).
Miller, 685.
France, 797.
Newton (*Root and Benjamin*), 953.
Gedge (*Chenet and Lacoste*), 956.
Justice, 1120.
Clark (*Merriam and Cushing*), 1130.
Simpson, 1189.

Steam generative engines, generating their own steam :
Roberts, 33.
Siemens, 114.
Roberts, 135.
Roberts, 208.
Brooman (*Archibald*), 300.
Nicholls, 640.
Newton (*Danford*), 889.
Muschamp and Card, 1043.
Chatwood and Sturgeon, 1055.

Steam and fluid jets, propelling by reaction :
Boulton, 1175.
Boyman, 1202.

Steam and pressure gauges. *See also* Gauges and meters :
Grew, 8.
Newton (*Allen*), 22.
Miller and Kemp, 45.
Pullan, 56.
Clarke, 85.
Albrecht, 173.
Searby, 184.
Collins, 194.
Eaves, 210.
Grimaldi, 237.
Bailey and Bailey, 298.
Barclay, 349.
Vidie, 352.
Weems and Weems, 355.
Barclay, 421.
Allcroft, 462.
Fyfe, 473.
Barclay, 496.
Silvester, 505.
Newton (*Justice*), 506.
Applegate, 525.
Munro and Scott, 535.
Murdoch, 565.
Naylor, 567.
Galloway and Galloway, 576.
Bailey, Blake, and Bailey, 588.
Mash, 611.
Brockhurst and Sullivan, 643.
Weild (*Justice*), 737.
Johnson (*Riordan*), 892.
Gisborne, 898.
Wright, 900.
Hackett, 1037.
Thomson, 1054.
Davies (*Quinn*), 1103.
Coffey, 1138.
Belleville, 1183.

Steam generators (variously composed of coiled or bent tubes, or of groups of tubes, or of chambers in series communicating and combined therewith, or disposed alone in furnaces and furnace chambers). *See also* Generating steam :
Grimaldi, 2.
Belleville, 11.
Rowan and Horton, 24.
Roberts, 35.
Ramsden, 40.
Sykes, Sykes, and Crossley, 49.
Gourlay and Kemp, 52.
Pascal, 77.

Steam generators, &c.—*cont.*
Miller, 80.
Romaine, 82.
Mennons (*Keiffler*), 94.
Grimaldi, 106.
Clark (*Joly*), 144.
Davies (*Montgomery*), 158.
Matheson, 169.
Mennons (*Fradet*), 182.
Rhodes, 197.
Benson, 205.
Roberts, 208.
Ridley, 211.
Sykes, Sykes, and Crossley, 226.
Hughes, 249.
Rowan and Horton, 260.
Green and Green, 280.
Fanshawe and Jaques), 282.
Hayes, 284.
Williamson, 285.
Hewett, 302.
Brooman (*DeBeauregard*), 303.
Newton (*Rafael*), 312.
Howden, 315.
Clark, 316.
Williamson, 323.
Bennett, 343.
Williamson, 347.
Anderson, 369.
Elder, 373.
Johnson (*Harrison*), 380.
Chamberlain, 465.
Inglis, 493.
Mein, 556.
Cutler, 601.
Martin, 613.
Kidd, 636.
Lane, 641.
Barwell, 665.
Rickett, 666.
Rowing, 671.
Rowing, 687.
Newton (*Wiart*), 703.
Johnson (*Harrison*), 1278 (*Supplement*).
Marshall, 717.
Davies (*Holagray*), 750.
Huch and Windhausen, 769.
Clark (*Duméry*), 789.
Stott, 792.
Salmon, 802.
Twibill, 833.
Hulley, 846.
Johnson (*Brown*), 853.
Romminger (*Möller*), 860.
Johnson (*Luders*), 874.
Johnson (*Brayton*), 887.
Boulton, 934.
Johnson (*Drivet*), 937.
Sturgeon, 960.
Johnson (*Harrison and Luders*), 960.
Jordon, 969.
Brooman (*Belleville*), 989.
Gedge (*Dufour*), 1010.
Howard and Bousfield, 1011.

Steam generators—*cont.*
Newton (*Danford*), 1024.
Bernard, 1083.
Field and Wise, 1103.
Fairbank, 1104.
Howard and Bousfield, 1115.
Ramsbottom, 1126.
Bousfield (*McKenzie*), 1126.
Twibill, 1150.
Coffey, 1198.
Boyman, 1202.

Steam hammers :
Hewitson and Walker, 1216 (*Supplement*).
Imray and Copeland, 1218 (*Supplement*).
Scott, 1223 (*Supplement*).
Joy, 148.
Fairbairn (*Haswell*), 1223 (*Supplement*).
Winton and Cowan, 1224 (*Supplement*).
Shand and Mason, 1227 (*Supplement*).
Bramwell and Owen, 217.
Hobson, 1232 (*Supplement*).
Norman, 1240 (*Supplement*).
Fearnley, 1240 (*Supplement*).
Wilson, 283.
Rowan, 1244 (*Supplement*).
Joy, 1245 (*Supplement*).
Philippson (*Schwartzkopff*), 1251 (*Supplement*).
Alleyne, 1252 (*Supplement*).
Butler, 1257 (*Supplement*).
Mellor and Whaley, 472.
Ramsbottom, 512.
Thompson, 520.
Gray, 524.
Sturgeon, 535.
Davy, 608.
Armstrong, 691.
Butler, 703.
Yule, 705.
Carbutt and Cutts, 735.
Crosland, 754.
Morrison, 792.
Ramsbottom, 822.
Newton (*Nillus, Nillus, Nillus, and Crouvés*), 830.
Ramsbottom, 839.
Dodge, 854.
Wright, 866.
Vaughan, 869.
Bakewell (*Johnson*), 878.
Pilkington, 898.
Massey and Massey, 907.
Davies, 939.
Emmet, 969.
Dufrené (*Thevenet*), 1018.
Berry, 1039.
Tongue (*James and Condict*), 1166.
Routledge and Ommanney, 1182.

Steam jackets. *See also* Heating cylinders, &c.:
Newton (*Waterman*), 44.
Macnab, 273.
Merritt, 276.
Newton (*Root*), 287.
Macnab, 332.
Park, 368.
Humphrys, 409.
Cowper, 428.
Beslay, 460.
Jackson and Watkins, 490.
Elder, 618.
Young and Kirk, 651.
Swann, 846.
Kochs, 1128.
Varley, 1137.
Newton (*Maryc*), 1163.

Steam jets employed for cleaning boiler tubes. *See* Cleaning boiler tubes, &c.

Steam jets employed as auxiliary power:
Makinson, 1211.

Steam jets hastening furnace draughts:
Delabarre, 42.
Bousfield (*Nichols*), 1152.

Steam jets inducing and impelling the flow of water and fluids. *See also* Feed water, supplying; Raising and forcing water, &c.:
Delabarre, 42.
Phillips, 50.
Newton (*Rogers*), 241.
Bousfield (*Chase*), 257.
Macintosh, 292.
Clark (*Pradel and Wahl*), 341.
Parker, 1248 (*Supplement*).
Newton (*Brear*), 1250 (*Supplement*).
Stewart and Robinson, 476.
Wilson, 478.
Fletcher and Bower, 478.
Barclay and Morton, 499.
Craig, 525.
Thompson, 531.
Gleave and Young, 539.
Humphrys, 543.
Johnson *Gardère and Patek*), 1267 (*Supplement*).
Parker, 602.
Barclay and Morton, 610.
Newton (*Lansdell, Alter, and Francis*), 649.
Barclay, 701.

Steam jets, &c.—*cont.*
Fletcher and Bower, 719.
Craig (*Turck*), 730.
Robinson and Gresham, 788.
Roger, 813.
Gresham, 842.
Boulton, 862.
Newton (*Sellers*), 875.
Brooman (*De Beauregard*), 908.
Boulton, 923.
McEwan and Neilson, 931.
Watkin, 951.
Wise, Field, and Aydon, 962.
Barclay, 1282 (*Supplement*).
Robertson, 1015.
Woodward and Woodward, 1017.
Gresham, 1057.
Thomson, 1064.
Newton (*Lansdell*), 1105.
Aydon and Field, 1112.
Robinson (*Sellers*), 1131.
Bousfield (*Nichols*), 1152.

Steam joints. *See* Joints, expansible, &c.; Joints and joining, &c.

Steam ports and passages. *See* Ports, ways, and passages, &c.

Steam power obtaining, increasing:
Boyman, 67.
Symons, 338.

Steam-power-wheels or engines:
Rutchet, Vonwiller, and Seiler, 8.
Boyman, 67.
Stevenson, 87.
Chevillard, 200.
Coffey, 268.
Macintosh, 292.
Parker, 1248 (*Supplement*).
Brakel, Hoehl, and Gunther, 384.
Braddock, 452.
Budden (*Pilkington*), 454.
Thomson, 531.
Lloyd, 586.
Verran, 606.
Southam, 665.
Ravard (*Brunier*), 743.
Knab, 759.
Galloway, 787.
Couprant, 813.
Brookes (*Perrigault, Farcot, Farcot, Farcot, Château, and Farcot*), 868.
Stevenson ([illegible]), 888.

Steam-power-wheels, &c.—*cont.*

- Gedge (*Appé*), 978.
- Wenner, 1053.
- Newton (*Farcot and Perrigault*), 1065.
- Fraser, 1117.
- White (*Sellier and Hermant*), 1143.
- Von Rathen, 1150.
- Newton (*Harris*), 1205.

Steam pressure regulators:

- Belleville, 11.
- Russell and Brown, 134.
- Cass, 202.
- Blake, 206.
- Bonneterre, Erhart, and Monti, 353.

Steam pumps. *See also* Pumping engines; and Rotary pumps:

- Shand and Mason, 1227 (*Supplement*).
- Knowelden, 297.
- Peel and Simpson, 1256 (*Supplement*).
- Brooman (*Dobbs*), 597.
- Wilson, 705.
- Ramsbottom and Blackburn, 807.
- Hicks, 828.
- Goodfellow, 860.
- Benson, 916.
- Newton (*Root and Benjamin*), 953.
- Hoskold and Brain, 992.
- Clark (*Cameron*), 1050.
- Brown, 1092.
- Reade (*Lansdell*), 1118.
- Worth, 1136.
- De Rusett and Dale, 1284 (*Supplement*).
- Newton (*Root*), 1156.
- Lake (*Earle*), 1158.
- Kirk, 1170.

Steam regulating valves. *See also* Valves:

- Béziat, 149.
- Blake, 206.
- Spink, 250.
- Holt, 276.
- Perrin, 305.
- Wood, 344.
- Farron, 366.
- Green and Mathers, 400.
- Dutton, 405.
- Morley, 471.
- Barrett, Exall, Andrewes, and Barrett (*Perry*), 538.
- Blake, 559.
- Bury and Price, 572.
- Pinède, 572.
- Smith, 609.

Steam regulating valves—*cont.*

- Clark (*Lemaire*), 635.
- Petrie, 791.
- Leatham, 884.
- Foubert, 933.
- Cole, Swift, and Soares, 935.
- Lewis, 1020.
- Fletcher, 1026.
- Bousfield (*McKenzie*), 1126.
- Haseltine (*Wiard*), 1168.
- Clark (*Peet*), 1210.
- Cutler and Brown, 1212.

Steam regenerated. *See* Regenerating worked and other steam.

Steam returned to the boiler after being worked. *See* Feeding worked steam to boilers.

Steam rollers:

- Clark and Batho, 1273 (*Supplement*).
- Henry (*Gellerat and Co.*), 771.
- Crispin, 1071.

Steam, separating watery particles from:

- Newton (*Waterman*), 44.
- Miller, 80.
- Sautter (*Gill*), 120.
- Townsend, 985.
- Pollit and Wigzell, 1034.
- Ireland, 1074.

Steam superheated. *See* Superheating, &c.

Steam tillage. *See also* Agricultural engines, and Agricultural implements:

- Savory and Savory, 1285 (*Supplement*).
- Rérolle, 1239 (*Supplement*).
- Romaine, 319.
- Fowler, Greig, and Noddings, 1249 (*Supplement*).
- Fowler, 1254 (*Supplement*).
- Webb, 1271 (*Supplement*).
- Howard, Bousfield, and Pinney, 644.
- Clark (*Blanchet*), 728.
- Steevens, 768.
- Blanchet, 809.
- Hall, 880.
- Howard and Bousfield, 881.
- Bowen, 988.
- Bischoff, 1035.
- Crispin, 1071.

Steam toy:
Sutton, 1177.

Steam trap. *See also* **Water of condensation, &c.:**
Robertson, 1190.

Steam valves and valvular apparatus:
Fuller, Jaques, and Fanshawe, 164.
Moulton, 167.
Hesford, 268.
Standfield, 293.
Clark and Hope, 520.
Needham and Pollitt, 604.
O'Neill, 718.
Russell, 886.
Nuttall, 900.
Jenkins, 919.
Newton (*Carhart*), 927.
Bennett, 974.
Moore (*Moore*), 993.
Waddell and Muir, 1060.
Adolph (*Charnoz*), 1108.
Scott and Hallowell, 1143.
Clark (*Peet*), 1210.

Steam whistles, combined or otherwise with safety valves, gauges, &c.:
Thomas, 3.
Aldred and Maynes, 28.
Pullan and Cresswell, 56.
Walker, 60.
Walker, 86.
Calvert, 118.
Warren, 179.
Barlow (*Voelckner*), 192.
Penn, 195.
Newton (*Rogers*), 241.
Brooman (*De Beauregard*), 303.
Watremez and Kloth, 365.
Auld and Auld, 447.
Fife, 473.
Lawrence, 668.
Courtauld, 877.
Cuthbert, 1059.
Cuthbert, 1144.

Steel combined with india-rubber for valves and springs:
Moulton, 167.

Steel plates for steam boiler construction:
Austin, 155.

Steering gear for engines and vessels, operated by steam:
Aveling, 57.
Taylor, 90.
Travis, 116.
Darley, 154.
Weallens, 188.
Wilson, 278.
Bray, 291.
Barclay, 349.
Death, 389.
Sickles, 437.
Faulds, 463.
Law and Downie, 479.
Barclay, 496.
Gedge (*Carmien*), 1290 (*Supplement B.*).
Howard, Bousfield, and Pinney, 507.
Morel, 553.
Clark and Batho, 1273 (*Supplement*).
Morel, 677.
Galloway, 787.
Galloway, 819.
Brooman (*Loubat*), 919.
Gray, 1206.

Stirring and clearing furnace fires:
Johnson (*Corbin-Desboissières*), 1.
Belpaire, 31.
Clark, 53.
Martin and Purdie, 125.
Martin and Wylam, 675.
Clark (*Dumèry*), 789.
Roger, 813.
Wilson, 843.
Lockwood, 938.
Abbott, 1099.

Stone working and crushing by machines combined with steam engines, or actuated direct thereby:
Stevens (*Canu*), 1232 (*Supplement*).
Low, 510.
Gray, 524.
Johnson (*Wright*), 1133.

Stop valves. *See also* **Valves:**
Taylor, 1063.
Coffey, 1138.

Stopping railway trains:
McGaulay, 161.
De Bergue (*De Bergue*), 915.
Naveaux, 915.

Stuffing boxes :
Bousfield (*Renwick*), 113.
Henry (*Million*), 289.
Pullan and Lake, 296.
Sievier, 1289 (*Supplement B.*).
Humphrys, 409.
Coulthard, 538.
Winans and Winans, 555.
Ripley, 557.
Burchall and Borrows, 1291 (*Supplement B.*).
Attwood, 747.
Brooman (*Laconfourque and Perrin*), 785.
Morrison, 792.
Duterne, 903.

Superheated steam. *See also* **Superheators :**
Parker, 1248 (*Supplement*).
Martin, 642.
Simes, 789.
Boulton, 934.

Superheating steam :
Belleville, 11.
Harrington, 13.
Yule, 18.
Wain, 25.
Yarrow and Neilson, 27.
Humphrys, 28.
Morrison, 30.
Ramsden, 40.
Horton and Kendrick, 46.
Brotherhood, 48.
Sykes, Sykes, and Crossley, 49.
Bell, 50.
Clark, 53.
Newton (*Normand*), 58.
Partridge, 59.
Bridgett, 60.
Butlin, 61.
Pullan, Cresswell, and Longstaff, 69.
Fletcher, 76.
Wenham, 79.
Soutter, 91.
Mennons (*Gâche*), 101.
Newton (*Caravalho*), 105.
Wehnert (*Trochon*), 109.
Sautter (*Gill*), 120.
Macnab, 124.
Williamson and Perkins, 126.
Grimshaw, 134.
Clark (*Joly*), 144.
Adamson, 165.
Chellingworth and Thurlow, 167.
Wilson, 172.
Johnson (*Prouvost*), 176.
Mennons (*Fradet*), 182.
Young, 188.
Weallens, 183.
Bremner, 201.
Brooks (*Martin*), 204.
Phillips, 206.
Ridley, 211.

Superheating steam—*cont.*
Sykes, Sykes, and Crossley, 226.
Armstrong, 230.
Chellingworth and Thurlow, 242.
Elson, 257.
Anthony, 262.
Brooman (*De Beauregard*), 304.
Allchin and Allchin, 307.
Selby, 308.
Parker, Wells, and Wells, 317.
Barclay, 349.
Huddart, 385.
Allibon and Snell, 387.
Green and Mathers, 400.
Macnab, 410.
Cowper, 428.
Nelson, 429.
Beslay, 460.
Bousfield (*Dickerson*), 504.
Thierry, 527.
Barron, 546.
Winans and Winans, 556.
Ivory, 590.
Martin, 613.
Oakley, 656.
Andreux and Coulon, 751.
Salmon, 802.
Galloway, 819.
Boulton, 848.
Boulton, 909.
Newton (*Danford*), 1024.
Stocks, 1036.
Campbell, 1040.
Chatwood and Sturgeon, 1055.
Holt, 1078.
Lishman, 1114.
Bonneville (*Petitpierre*), 1128.
Bousfield (*Thierry*), 1149.
Lewis, 1209.

Superheators :
Newton (*Normand*), 58.
Partridge, 59.
Butlin, 61.
Allen, 89.
Taylor, 90.
Newton (*Caravdlho*), 105.
Clark (*Joly*), 144.
Brooks (*Martin*), 204.
Clark (*Arnier*), 316.
Meriton, 327.
Hart and Lavender, 356.
Brooman (*Delafond and Corradi*), 378.
Huddart, 385.
Nelson, 429.
Brooman (*Delafond and Corradi*), 445.
Baldwin, 511.
Stocks, 1036.
Campbell, 1040.
Chatwood and Sturgeon, 1055.

Superheators combined with steam boilers and generators :
Belleville, 11.
Yule, 18.

Superheaters, &c.—*cont.*
Wain, 25.
Yarrow and Neilson, 27.
Humphrys, 28.
Ramsden, 40.
Horton and Kendrick, 46.
Bell, 50.
Weems, 53.
Pullan, Cresswell, and Longstaff, 69.
Soutter, 91.
Macnab, 124.
Johnson (*Prouvast*), 176.
Weallans, 188.
Bremner, 201.
Bury, 208.
Ridley, 211.
Sykes, Sykes, and Crossley, 226.
Anthony, 262.
Green and Green, 280.
Fanshawe and Jaques, 282.
Allchin and Allchin, 307.
Monckton, 318.
Williamson, 347.
Clark (*Louvie*), 1264 (*Supplement*).
Howard Bousfield, and Pinney, 507.
Goucher, 515.
Winans and Winans, 556.
Brooman (*Meyn*), 591.
Newton (*Wiart*), 703.
Brooman (*Belleville*), 989.
Howard and Bousfield, 1011.
Bousfield (*McKenzie*), 1126.
Bonneville (*Petitpierre*), 1128.

Tanks for feed water:
Death, 389.
Hall, 634.

Tenders carrying engine power:
Mennons (*Velini*), 383.
Sturrock, 526.

Tools and apparatus for cleaning boiler tubes and flues:
Hardy, 1.
Walls, 3.
Green and Green, 280.
Fox, 594.
Bonneville (*Chaudoir*), 683.
Hare, 897.
Caithness, Earl of, 1089.
Green, 1140.
Robinson, 1192.
Newton (*Joublin*), 1201.

Traction steam engines:
Chaplin, 10.
Taylor, 20.
Aveling, 57.
Clayton and Shuttleworth, 73.
Taylor, 90.
Travis, 116.
Darley, 154.

Traction steam engines—*cont.*
Chellingworth and Thurlo 167.
Stevens (*Stevens*), 225.
Lee and Taplin, 227.
Simonton, 239.
Chellingworth and Thurlo 242.
Lee and Taplin, 264.
Marshall, 279.
Bray, 291.
Pullan and Lake, 296.
Lee, 330.
Fowler, Greig, and Nodding 1249 (*Supplement*).
Barclay, 349.
Lee, 361.
Fowler, 1254 (*Supplement*).
Lee, 382.
Death, 389.
Selby, 419.
Barclay, 421.
Barclay, 422.
Savage, 423.
Lee and Lee, 426.
Faulds, 463.
Jones, 464.
Aveling, 1263 (*Supplement*).
Law and Downie, 479.
Barclay, 496.
Biddell, 500.
Howard, Bousfield, and Pinne 507.
Blackburn, 548.
Morel, 553.
Hornsby, Bonnall, and Astbur 562.
Webb, 1271 (*Supplement*).
Clark and Batho, 1273 (*Supp ment*).
Morel, 677.
Roberts, 679.
Lee, 715.
Turner and Turner, 1278 (*S plement*).
Payne, 749.
Salmon, 802.
Henry (*Bernier and L marest*), 834.
Mackenzie, 861.
Alleyne, 870.
Gedge (*Taillendeau*), 873.
Hall, 880.
Keene (*Richards*), 920.
Bischoff, 1035.
Clark, 1107.
Appleby, 1107.
Phillips-Smith, 1129.
Brooman (*Chauveau and Carfort*), 1182.

Transmitting motion to drivi wheels:
Hawksley, 1237 (*Supplement*
Lee and Taplin, 264.
Lee, 1243 (Supplement).

Transmitting motion, &c. —*cont.*
Pullan and Lake, 296.
Joblin, 301.
Lee, 361.
Lee, 382.
Makinson, 393.
Selby, 419.
Barclay, 422.
Savage, 423.
Lee and Lee, 426.
Aitken, 456.
Faulds, 463.
Aveling, 1268 (*Supplement*).
Makinson, 492.
Barclay, 496.
Biddell, 500.
Sturrock, 526.
Morel, 553.
Webb, 1271 (*Supplement*).
Clark and Batho, 1273 (*Supplement*).
Howard, Bousfield, and Pinney, 644.
Penrice, 670.
Morel, 677.
Roberts, 679.
Lee, 715.
Crowe, 724.
Clark (*Blanchet*), 728.
Payne, 749.
Henry (*Gellerat and Co.*), 771.
Blanchet, 809.
Mackenzie, 861.
Alleyne, 870.
Gedge (*Taillendeau*), 873.
Wilson, 917.
Brooman (*Loubat*), 919.
Keene (*Richards*), 920.
Loubat, 974.
Shaw, 1016.
Clark, 1107.
Appleby, 1107.

Transparent eye pieces for examining the interior of boilers:
Galloway, Galloway, and Wilson, 252.
Whitehead, 282.

Trunk steam engines:
Rowan and Horton, 24.
Dean, Knowles, and Knowles, 34.
Gourlay and Kemp, 52.
Howden, 150.
Davison and Paterson, 199.
Dickinson, 269.
Brooman (*Archibald*), 300.
Mennons (*Belou*), 325.
Macnab, 332.
Humphrys, 351.
Knowelden, 366.
Humphrys, 409.

Trunk steam engines—*cont.*
Clark (*Meyer and Meyer*), 461.
Hornsby, Bonnall, and Astbury, 562.
Allen, 662.
Huch and Windhausen, 769.
Stocker, 986.
Clark (*Whiting and Rowland*), 991.
Newton (*Root*), 1156.

Trunk pistons:
Rowan and Horton, 24.
Wain, 25.
Dean, Knowles, and Knowles, 34.
Gourlay and Kemp, 52.
Shaw, 1234 (*Supplement*).
Dickinson, 269.
Humphrys, 351.
Knowelden, 366.
Humphrys, 409.
Hornsby, Bonnall, and Astbury, 562.
Allen, 662.
Hicks, 828.
Wheeler, 994.

Thermo-dynamic engine:
Newton (*Rafael*), 312.

Throttle valves and working gear. *See also* Valves.
Leatham, 29.
Hamilton and Silver, 31.
Johnson (*Duvoir*), 83.
Murton and Millington, 117.
McNaught, 128.
Pearce, 142.
Gillies, 146.
Kinsey, 253.
Perrin, 305.
Parkinson and Marsland, 399.
Dugdale, 483.
Walker, 484.
Bury and Price, 572.
Pinède, 572.
Dean, 855.
Haseltine (*Shive*), 1078.

Tubes within tubes in boilers for causing circulation of the water:
Rowing, 687.
Newton (*Wiart*), 708.
Cochrane, 751.
Wise, Field, and Aydon, 962.

Tube plates:
Randolph and Elder, 516.
Heather and Redfern, 534.
Newton (*Judson*), 598.
Newton (*Howell and Birdsall*), 657.

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Bousfield (*Judson*), 711.
Newton (*Lighthall*), 714.
Newton (*Stimers*), 1280 (*Supplement*).
Newton (*Judson*), 881.
Newton (*Stimers*), 911.
Soutar (*McDowell*), 943.

Tubes and chambers in the furnaces and flues of steam boilers:
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Harlow, 1231 (*Supplement*).
Hydes, 145.
Kinsey, 253.
Hesketh and Parsell, 263.
Holt, 276.
Hayes, 284.
Brooman (*Friedmann and de Erlanger*), 285.
Brooman (*Friedmann and de Erlanger*), 813.
Johnson and Morris, 351.
Hirst and Taylor, 386.
Smith, 513.
Brooman (*Keyn*). 591.
Brooman (*Pierret and Schweizer*), 615.
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Marshall, 717.
Palmer, 731.
Cochrane, 751.
Blampoil, 797.
Millar, 810.
Cass, 840.
Thomson. 841.
Alleyne, 845.
Barclay, 921.
Smith and Batho, 956.
Wise, Field, and Aydon, 962.
Chaplin, 966.
Wilson, 988.
Barclay, 996.
Hall, 1009.
Vuldy, 1045.
Chesters, 1054,.
Botterill, 1069.
Green, 1073.
Green, 1087.
Frazer, 1092.
Lees, 1095.
Daglish, 1143.
Twibill, 1150.
Robertson, 1162.
Wilson, 1164.
Tongue (*Miller*), 1170.
Lewis, 1209.

Tubes and pipes for boilers, condensers, and superheators:
Howell, 44.
Fletcher, 76.
Apsey and Buckwell, 79.

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Allen and Glasson, 89.
Miller, 98.
Green and Asbury, 111.
Wall, 196.
Hawksley and Wild, 197.
Davison and Paterson, 199.
Burch, 221.
Allan, 224.
Green and Green, 280.
Monckton, 318.
McConnell, 337.
Anderson, 369.
Adamson and Leigh, 394.
Brooman (*Delafond and Corradi*), 445.
Chamberlain, 465.
Thompson, 520.
Jeffreys, 521.
Spencer, 552.
Mein, 556.
Newton (*Judson*), 593.
Cochrane, 751.
Lloyd and Lloyd (*Knickerbocker*), 753.
Lloyd and Lloyd (*Blackwood*, 753.
Reid (*Clark*), 767.
Stott, 792.
Newton (*Lavery and Stuart*), 808.
Galloway, 819.
Brooman (*Meunier*), 854.
Romminger (*Möller*), 860.
Tweddell, 891.
Ashby, 912.
Ghiselin (*Clark*), 964.
Bousfield (*Dudgeon*), 1042.
Gibson and Ellis, 1088.
Field and Wise, 1103.
Plant, 1122.

Tunnelling by steam machinery. *See* Excavating, &c.

Turbines for steam or water:
Hughes (*Voss*), 41.
Turner, 250.
Parker, 1248 (*Supplement*).
Schiele, 561.
Hoehl, Brakell, and Günther, 589.
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Harrison, 621.
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Paterson, 75.
Simonton, 239.
Howard, Bousfield, and Pinney, 507.
Henry (*Gellerat and Co.*), 771.
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'urning engine cranks over the dead centres:
Handcock, 241.
Parker, Wells, and Wells, 246.
Bischoff, 1035.
White (*Ansaldi*), 1180.

Jniting boiler plates. *See also* Joints and joining.
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Russell, 1279 (*Supplement*).
Baldwin, 1147.

Jpright steam boilers. *See also* Steam boilers.
Horton and Kendrick, 46.
Weems, 53.
Fletcher, 76.
Calvert, 118.
Macnab, 124.
Riddell, 127.
Burch, 137.
Wilson, 181.
Vavasseur, 184.
Shand and Mason, 1227 (*Supplement*).
Burch, 221.
Shaw, 1234 (*Supplement*).
Hughes, 249.
Galloway, Galloway, and Wilson, 252.
Kinsey, 253.
Chaplin, 1239 (*Supplement*).
Meriton, 327.
Tolhausen (*Larmanjet*), 333.
Shand and Mason, 391.
Green and Mathers, 400.
Inglis, 455.
Lee and Winter (*Larned*), 540.
Roberts, 543.
Shand, 549.
Winans and Winans, 1267 (*Supplement*).
Brooman (*Meyn*), 591.
Cutler, 601.
Oakley, 656.
Winstansley and Kelly, 659.
Clayton, 670.
Thomson, 841.
Alleyne, 845.
Newton (*Thayer and Pond*), 859.
Elliott, 914.
Green and Green, 945.
Chaplin, 966.
Newton (*Davis, Davis, and Anable*), 983.
Wheeler, 983.
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Davies (*Schaubel*), 1067.
Green, 1073.
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Burrows and Burrows, 1090.

Utilizing waste heat. *See also* Heating steam boilers:
Brooman (*Lequin*), 616.
Blacke, 864.
Newton (*Fletcher*), 975.
Tongue (*Patan*), 1016.

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Lillie, 756.
Parry, 922.
Daina, 949.

Vacuum engines:
Blake, 206.
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Vacuum valves and gauges:
Newton (*Allen*), 22.
Fletcher, 98.
Albrecht, 173.
Searby, 184.
Bailey and Bailey, 298.
Allcroft, 462.
Murdock, 565.
Brockhurst and Sullivan, 648.
Adams and Parson, 965.

Valves are placed under the following heads, viz.:—Ball valves; Blow-off valve and cocks; Combined valves; Cocks and valves; Cut-off expansion valves and working gear; Delivery valves; Distributing cocks and valves; Exhaust valves and working gear; Expansion valves; Feed regulating valves; Foot valves; Fusible plugs and valves; Indicating gauges, valves, and cocks; Induction valves; Oscillating valves; Piston valves; Pump valves; Regulating valves; Safety valves; Slide valves and working gear; Steam regulating valves; Steam valves and cocks and valvular apparatus; Stop valves; Throttle valves; Vacuum valves and gauges; Valves

Valves, &c.—*cont.*
for air, gas, and vapour engines; Valves and working gear for compound engines; Valves and working gear for steam hammers; and

Valves and working gear for steam engines:
Newton (*Schultz and Hauck*), 2.
Johnson (*Fossey*), 1216 (*Supplement*).
Hartley, 16.
Morrison, 30.
Newton (*Crosby, Savage, and Stearns*), 71.
Clark (*Riff and Laudenmüller*), 100.
Travis, 116.
Calvert, 118.
Joy, 143.
Crosland, 147.
Fuller, Jaques, and Fanshawe, 164.
Prentiss (*Williams*), 169.
Barling, 187.
Bury, 208.
Mash, 216.
Hargreaves and Hargreaves, 256.
Beer, 264.
Knight (*Lee*), 1238 (*Supplement*).
Davies and Evans, 268.
Fearnley, 1240 (*Supplement*).
Calvert, 277.
Henry (*Gifford*), 282.
Brooman (*Archibald*), 300.
Beer, 322.
Camp (*Steele*), 339.
Adams, 343.
Kay and Hartley, 362.
Fielding, Fielding, Fielding, and Fielding, 363.
Childs (*Ray, Redstone, and Redstone*), 377.
Hook, 390.
Goodfellow, 410.
Wood, 415.
Unsworth, 436.
Musgrave, 439.
Caird, 449.
Morley, 471.
Walker, 484.
Penn, 488.
West, 498.
Coulthard, 536.
Clark (*Root*), 550.
Bury and Price, 572.
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Stanley and Stanley 1269 (*Supplement*).
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Crease, 603.
Holman, 606.
Rowing, 687.
Newton (*Perret*), 690.
Gedge (*de Montméja*), 720.
Messer, 732.
Blake (*Blake*), 733.
Stevenson, 742.
Taylorson, 762.
Petrie, 791.
Gedge (*de Montméja*), 801.
Davey, 803.
Henry (*Foucault*), 806.
De Bergue (*De Bergue*), 818.
Spencer, 821.
Newton (*Rankin*), 847.
Vaughan, 869.
Massey and Massey, 907.
De Bergue (*De Bergue*), 915.
Benson, 916.
Bristol, 921.
Newton (*Davis*), 923.
Clark (*Washburn*), 944.
Hunt, 968.
Kerr (*Hughes and Phillips*), 1031.
Lewis, 1068.
Atkinson, 1073.
Beale, 1081.
Yule, 1090.
Kittoe, 1096.
Turton, 1101.
Elder, 1114.
Clark (*Phillips and Hewes*), 1115.
Naylor, 1117.
Ramsbottom, 1126.
Varley, 1137.
Newton (*Root*), 1156.
Deacon, 1161.
Bracewell, Pickup, and Lund, 1177.
Bousfield (*Babcock and Wilcox*), 1214.

Valves for air, gas, and vapour engines:
Boulton, 729.

Valves and working gear for compound engines:
Williamson and Perkins, 126.
Edge, 131.
Macnab, 273.
Selby, 308.
Howden, 315.
Humphrys, 357.
Elder, 373.
Glanville, 417.
Selby, 419.
Milner, 471.
Inchley, 595.
Löbnitz, 755.
Ivory, 781.

Valves and working gear for steam hammers:
Hewitson and Walker, 1216 (*Supplement*).
Imray and Copeland, 1218 (*Supplement*).
Joy, 143.
Hobson, 1232 (*Supplement*).
Fearnley, 1240 (*Supplement*).
Wilson, 283.
Joy, 1245 (*Supplement*).
Philippson (*Schwartzkopff*), 1251 (*Supplement*).
Musgrave, 439.
Ramsbottom, 512.
Sturgeon, 535.
Davy, 608.
Yule, 705.
Stevenson, 742.
Pilkington, 898.
Massey and Massey, 907.
Dufrené (*Thevenet*), 1018.
Berry, 1039.
Tongue (*James and Condict*), 1166.

Vaporizers and vaporizing fluids. *See also* **Generating steam:**
Wilson, 1228 (*Supplement*).
Wilson, 1241 (*Supplement*).
Jordan, 1105.

Ventilation of engine rooms and places:
Newton (*Brandt*), 150.
Sievier, 1287 (*Supplement B.*).
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Graveley, 765.
Newton (*Somes*), 857.
Aydon and Field, 1112.

Vibration, prevention of:
Silver, 65.
Selby, 308.
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Barclay, 495.
Joyce, 661.
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Vulcanite, employed for tube plates and valves:
Fuller, Jaques, and Fanshawe, 164.
Newton (*Judson*), 593.

Vulcanized indian-rubber used in and about steam engines, boilers and valves:
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Normandy, 66.
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Eddington, 139.
Fuller, Jaques, and Fanshawe, 164.
Chellingworth and Thurlow, 242.
Kinsey, 253.
Rowan and Horton, 260.
Barré, 263.
Johnson (*Voss*), 360.
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Newton (*Booraem*), 585.
Newton (*Judson*), 593.
Bousfield (*Judson*), 711.
Sanders, 746.
Foster, 826.
Newton (*Jackson*), 881.
Jenkins, 919.
Spencer 1007.
Howard and Bousfield, 1011.
Waddell and Muir, 1060.
Ingram and Phillips, 1093.
Keirby, 1136.
Barwick and Tindall, 1200.

Water of condensation discharged from cylinders, pipes, and vessels:
Fletcher, 98.
Delesalle, 126.
Crosland, 147.
Cass, 202.
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Harlow, 1231 (*Supplement*).
Elson, 257.
Brooman (*Duballe*), 266.
Bailey and Bailey, 298.
Needham, 311.
Weems and Weems, 355.
Parker (*Schaffer*), 359.
Bünger (*Andreae*), 433.
Blake, 559.
Alcan (*Gauchez*), 567.
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Wyllie and Gray, 883.
Norton and Bünger, 1005.
Winans and Winans, 1051.
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Water gauges and indicators:
Thomas, 3.
Morrison, 30.
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Walker, 60.
Walker, 86.
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Warren, 179.
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Farron, 244.
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Howat, 394.
Fyfe, 473.
Galloway and Galloway, 576.
Healey, 604.
Clark (*Weyher*), 629.
Bond, 637.
Burrell, 674.
Trustwell and Trustwell, 811.
Johnson (*Riordan*), 892.
Bennett, 974.
Draper and Leech, 977.
Johnson (*Wright*), 1133.
Johnson and Smith, 1134.

Water jets, inducing and impelling the flow of aeriform fluids:
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Water level maintained in portable, locomotive, and similar boilers on inclines and common roads:
Darley, 154.
Homersham, 220.
Chellingworth and Thurlow, 242.
Lee, 330.
Lee, 382.
Mennons (*Velini*), 383.
Death, 389.
Law and Downie, 479.
Cope, 686.
Adams, 785.

Water meters. *See also* Gauges and meters.
Clark (*Foster and Foster*), 452.
Thomson, 486.
Newton (*Isham*), 927.
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Water space in steam boilers, lessening of:
Armour, 198.
Huddart, 485.
Johnson (*Drivet*), 937.

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Macnab, 124.
Galloway and Galloway, 156.
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Fanshawe and Jaques, 282.
Topham, 358.
Elder, 373.
Adamson and Leigh, 394.
Macnab, 410.
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Chamberlain, 465.
Morley, 471.
Rowing, 687.
Newton (*Wiart*), 703.
Marshall, 717.
Palmer, 731.
Cochrane, 751.
Wise, 772.
Clark (*Duméry*), 789.
Newton (*Thayer and Pond*), 859.
Rydill, 872.
Newton (*Mitchell*), 900.
Barclay, 921.
Newton (*Sergeant*), 939.
Green and Green, 945.
Smith and Batho, 956.
Wise, Field, and Aydon, 962.
Wheeler, 983.
Wilson, 988.
Barclay, 996.
Hall, 1009.
Bischoff, 1035.
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Newton (*Feyh and Emery*), 1166.
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Water tubes and chambers in furnaces and flues of steam boilers. *See* Tubes and chambers in furnaces, &c.

Water wheels. *See also* Coupling steam engines and water wheels:
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Johnson, 1229 (*Supplement*).
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Marshall, 279.
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Pullan and Lake, 296.
Selby, 308.
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Knowelden, 366.
Lee, 382.
Manzini, 407.
Aveling, 1263 (*Supplement*).
Fell, 473.
Webb, 1271 (*Supplement*).
Fell, 628.
Clark and Batho, 1273 (*Supplement*).
Penrice, 670.
Lee, 715.
Crockford, 801.
Salmon, 802.
Wilson, 817.
Galloway, 819.
Howard, 850.
Leatham, 884.
Brooman (*Loubat*), 919.
Keene (*Richards*), 920.
Ramsbottom, 929.
Hulme, 950.
Fell, 1138.
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Winding drums for agricultural engines and implements:
Kirby, 234.
Savory and Savory, 1235 (*Supplement*).
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Hall, 880.
Howard and Bousfield, 881.

Wire gauze, used in boilers:
Mennons (*Lehot*), 182.

Wood, used for packing, in the fixing of boiler tubes:
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Working air, gas, and vapour engines, special modes of:
Johnson (*Lenoir*), 170.
Johnson (*Prouvost*), 176.
Gjers, 212.
Arbòs, 444.
Boulton, 862.

Working compound high and low pressure steam engines, there being specialty in the modes or constructive arrangements:
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Rowan and Horton, 24.
Gourlay and Kemp, 52.
Wenham, 79.
Macnab, 124.
Williamson and Perkins, 126.
McNaught, 128.
Mardell, 154.
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Cass, 202.
Miller, 215.
Rollo, 232.
Colburn, 259.
Howden, 315.
Macnab, 332.
Elder, 373.
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Henderson (*McLardy*), 447.
Milner, 471.
Smethurst, 1266 (*Supplement*).
Rooke, 864.
Howard (*Jackson*), 959.
Elder, 1046.
Crosland, 1062.
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Working condensers, special modes of:
Rippingille, 328.
Amos, 370.
Colburn, 405.
Datichy, 421.
Bousfield (*Stevens*), 529.
Wright, 678.
Newton (*Lighthall*), 714.
Gwynne, 775.
Davey, 803.
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Working condensing engines without air pumps:
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Davison and Paterson, 199.
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Newton (*Lee*), 326.
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Lupton, Whittaker, Whittaker, and Hartley, 655.
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Gillis, 32.
Haworth, 174.
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Davies (*Jenkins and Jumelle*), 414.
Newton (*Wackernie*), 651.
Henry (*Foucault*), 806.
Henry (*Foucault*), 1109.
Smith and Jackson, 1212.

Working gear for steam engine valves :

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McNaught, 23.
Newton (*Crosby, Savage, and Stearns*), 71.
Rollo, 232.
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Hargreaves and Hargreaves, 256.
Knight (*Lee*), 1238 (*Supplement*).
Hesford, 268.
Davies and Evans, 268.
Newton (*Stevens*), 270.
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Beer, 322.
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Desgrandschamps, 397.
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Brakell, Hoehl, and Günth (*Westfield*), 589.
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Clark (*Lemaire*), 635.
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Barlow (*Salter*), 688.
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Taylor and Dow, 719.
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Brookes (*Vabe*), 824.
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Clark (*Cameron*), 1050.
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Newton (*Waterman*), 44.
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Murton and Millington, 117.
Calvert, 118.
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Dawson (*Kennish*), 166.
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Newton (*Rogers*), 241.
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Henry (*Gifford*), 282.
Brooman (*Archibald*), 300.
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Parker (*Schäffer*), 359.
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Brooman (*Delafond and Corradi*), 378.
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Ivory, 781.
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Galloway, 819.
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Fletcher and Hamer, 835.
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Lawrence (*Ewbank*), 859.
Vaughan, 869.
Wyllie and Gray, 883.
Newton (*Danford*), 889.
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Hawdon, Hawdon, and Heather, 1055.
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Fraser, 1117.
Bennett, 1147.
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Wenham, 79.
Cartwright, 88.
Williamson and Perkins, 126.
Taylor and Cooper, 164.
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Colburn, 259.
Parker (*Schäffer*), 359.
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Brown, 402.
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11. An historical account of a new method for extracting the foul air out of ships, &c., with the description and draught of the machines by which it is performed, &c. By SAMUEL SUTTON, the Inventor. To which are annexed two relations given thereof to the Royal Society by Dr. Mead and Mr. Watson. (*Letters Patent, No.* 602, *dated* 16*th March* 1744.) Price 1*s.*; by post, 1*s.* 1*d.*

12. The letter of Master WILLIAM DRUMMOND for the construction of machines, weapons, and engines of war for attack or defence by land or sea, &c, Dated the 29th Septemper 1626. (*Scotch Patent, temp. Car. II.*) Price 4*d.*

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B. WOODCROFT.

July 10, 1871.

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